# *Proceedings of the*
# American Association of Textile Chemists and Colorists

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JANUARY 16, 1956

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#### NEW YORK

*Chairman* ..... JOHN H HENNESSEY, Berkshire Color & Chemical Co, Delawanna, N J
*Secretary* ..... NORMAN A JOHNSON, American Dyestuff Reporter, 44 East 23rd St, New York 10, N Y
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*Chairman* ..... JOHN WALLACE, Supersilk Hosiery Mills, 1151 Florence St, London, Ontario, Canada
*Secretary* ..... KENNETH A LISTER, Canadian Industries Ltd, 92 Kirg St E, Hamilton, Ontario, Canada
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*Chairman* ..... THOMAS H HART, Hart Products Corp, P O Box 5025, Philadelphia 11, Pa
*Secretary* ..... ERNST W EMPTING, General Dyestuff Co, 123 S 2nd St, Philadelphia 6, Pa
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#### PIEDMONT

*Chairman* ..... CLARENCE HOOPER, Burlington Industries, 427 S Broad St, Burlington, N C
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*Chairman* ..... WILLIAM F LUTHER, Dixie Mercerizing Co, Chattanooga 1, Tenn
*Secretary* ..... ERNEST V HELMS, Geigy Dyestuffs, Div Geigy Chemical Corp, 276 S Crest Rd, Chattanooga 4, Tenn
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#### SOUTHEASTERN

*Chairman* ..... JAMES W SWINEY, Fulton Bag & Cotton Mills, Atlanta, Ga
*Secretary* ..... EDWARD R RAVENEL, Morton Salt Co, Decatur, Ga
*Vice Chairman*—WM B GRIFFIN *Treasurer*—WM E FAYSSOUX

#### WASHINGTON

*Chairman* ..... GEORGE S BUCK, JR, National Cotton Council of America, 1832 M St, NW, Washington 6, D C
*Secretary* ..... NELSON F GETCHELL, National Cotton Council of America, 1832 M St, NW, Washington 6, D C
*Vice Chairman*—GEORGE P FULTON *Treasurer*—LOUIS R MIZELL

### *Western Region*

#### MID-WEST

*Chairman* ..... ARTHUR I HULTBERG, Bear Brand Hosiery Co Kankakee, Ill
*Secretary* ..... WARREN B BROADBENT, Geigy Dyestuffs, 629 W Washington Blvd, Chicago, Ill
*Vice Chairman*—SAMUEL M LITTLEJOHN *Treasurer*—K M HARMS

#### PACIFIC NORTHWEST

*Chairman* ..... ROBERT E NEWMAN, Jantzen Knitting Mills Portland, Ore
*Secretary* ..... FREDERICK H IHLENBURG, National Aniline Div, Allied Chemical and Dye Corp, 730 Burnside St, Portland 9, Ore
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*Chairman* ..... JOHN SMITH, Dyemasters, Inc, 363 East Beach St, Inglewood, Calif
*Secretary* ..... CLARICE H LINDSEY, Univ of Calif, Dept of Home Economics, Los Angeles 24, Calif
*Vice-Chairman* ..... ROBERT A FLIEGEL *Treasurer* ..... ANGUS H ROBERTS

## Student Chapters

BRADFORD DURFEE TECHNICAL INSTITUTE, CLEMSON COLLEGE, FAIRLEIGH DICKINSON COLLEGE, GEORGIA INSTITUTE OF TECHNOLOGY, LOWELL TECHNOLOGICAL INSTITUTE, NEW BEDFORD INSTITUTE OF TEXTILES AND TECHNOLOGY, NORTH CAROLINA STATE COLLEGE, PHILADELPHIA TEXTILE INSTITUTE, RHODE ISLAND SCHOOL OF DESIGN, UTICA TECHNICAL INSTITUTE

# AATCC Newsgram

January 16, 1956

PERKIN CENTENNIAL

The following information is offered to define more clearly the AATCC Convention picture for 1956:

In 1956 there will be no separate AATCC Convention as such but it will be part of the Perkin Centennial, all functions of which will be open to all Centennial registrants.

There will be no registration fee to those attending the Perkin Medal Banquet only. All other functions will be open only to registrants, and there will be one registration fee for any part or all of the Centennial.

There will be no AATCC Convention Technical Program as in the past, such as group meetings on hosiery dyeing, auxiliaries, etc. Instead, it will be those topics in the complete Centennial Program which will be of interest to AATCC members. AATCC and ASTM are jointly sponsoring the topic, "Colorfastness," speakers and titles to be announced later. The Intersectional Contest will be held as usual.

All suites at the Waldorf will be assigned by the Registration and Reservation Committee, Patrick J Kennedy, chairman. All suites cannot be assigned to AATCC members only, as recognition must be made of the participating societies. It has been suggested that one suite for each participating society be made available for assignment by them if desired. Suites or rooms at the Waldorf are not to be used for commercial exhibits.

Tickets for the annual AATCC banquet, which will be held Saturday, Sept 15th, will be available to Centennial registrants only. It is planned that tickets will be assigned in the order that applications are received, including those from Centennial registrants from other societies.

RESEARCH NEWS IN GENERAL

In order that a study of suggested improvements on the Crockmeter may be made, the Committee on Colorfastness to Crocking will be reactivated. . . . Charles A Seibert has recently completed an extensive report on Color Fading of Textiles in Sunlight Tests; the report has been received at Lowell and is being prepared for reproduction. . . . Approximately 2,000 test specimens, which were exposed to sunlight of different energy levels at Chicago, Ill; Miami, Fla; and Phoenix, Ariz, are being meticulously mounted on specially-printed cards by the staff at Lowell, under the guidance of C H A Schmitt, for the Committee on Lightfastness. . . . Work of collecting material for the 1956 Technical Manual and Year Book has been started, and committee chairmen have been requested to file their reports of activities for the year 1955. They have also been requested to review test methods under their jurisdiction, for possible corrections, additions or revisions.

AT RESEARCH HEADQUARTERS IN LOWELL

AATCC Research Laboratories have developed an improved type of No. 180 Abrasive Liner, which is quickly and easily mounted in the Accelerotor. This improved liner is now available from Atlas Electric Devices Co, 4114 N Ravenswood Ave, Chicago 13, Ill. . . . Staff of the lab has prepared a special review of the flammability problem — including the development of test methods, legislation, etc, for the past 11 years — for the Executive Committee on Research.

Visitors to AATCC headquarters included William J Barnes and C B Westerhoff of the Colloidal Products Department, Naugatuck Chemical Division, U S Rubber Co, who spent considerable time with Dr Stiegler and Harlan Glidden, discussing the Accelerotor. . . . Miss Gertruida Louw, instructress in Home Economics, on sabbatical leave from the University of Stellenbosch, in Stellenbosch, South Africa, included Lowell Technological Institute and the AATCC Laboratories in her itinerary of visits to universities and research centers in the U S. Miss Louw expressed a strong interest in the Association's Research Program. . . . She visited AATCC Laboratories at the suggestion of Jules Labarthe of the Mellon Institute.

COMMITTEE NEWS

The 1956 lineup of committees in the Association's research program will be released in the next few weeks, and changes or additions to these committees will be reported in the next Newsgram.

# MEMBERSHIP APPLICATIONS

Dec 16, 1955

*SENIOR*

*Houghton G Clapp*—Chief supervisor, Plant Technical Section, E I du Pont de Nemours & Co, Inc, Penns Grove, N J. Sponsors: M A Perkins, H A Schroeder.

*Pierre De Saint Phalle*—Sales mgr, Nicetown Dye Works, Philadelphia, Pa. Sponsors: H R Steen, F W Allendorf.

*John D Egan, Jr*—Tech repr, Electrochemicals Dept, E I du Pont de Nemours & Co, Inc, Wilmington, Del. Sponsors: R R S Black, T E Bell.

*Earle K Ewing*—Tech demonstrator, Organic Chemicals Dept, E I du Pont de Nemours & Co, Inc, Wilmington, Del. Sponsors: H H Field, M D Harvey, Jr.

*Hans Z Lecher*—Consulting chemist, Plainfield, N J. Sponsors: C W Dorn, J F Warner.

*Guillermo Marti, C*—Tech director, Tejidos de Seda y Artisela, Mixcoac, Mexico. Sponsors: E Aboumrad, C P Bolde.

*Thomas J McGinn*—Dyer, Nicetown Dye Works, Philadelphia, Pa. Sponsors: H F Steen, F W Allendorf.

*William F Mitchell*—Research Division, Cabin Crafts, Inc, Dalton, Ga. Sponsors: W F Crayton, M S Morrison, Jr.

*John S B Morrison*—Chemist, Simplex Wire & Cable Co, Cambridge, Mass. Sponsors: A W Mack, W G Brown.

*Irwin Norman*—Sec leader, Physical Chem Section, Courtaulds Inc, Mobile, Ala. Sponsors: H L Wise, G V Lund.

*Robert H Pete*—Tech service repr, E I du Pont de Nemours Co, Inc, Wilmington, Del. Sponsors: R A Secord, H D Terhune.

*Howard M Pinner, Jr*—Asst research dir, Graniteville Co, Graniteville, S C. Sponsors: S Converse, G H Momeier.

*Edward S Shanley*—Asst tech dir, Becco Chem Div, Food Machinery & Chem Corp, Buffalo, N Y. Sponsors: J F Shea, B K Easton.

*Peter J Voorwald*—Plant-mgr, Anilinas Holandesas do Brasil S A Comercio e Industria, Sao Paulo, Brazil.

*Carl J Wessel*—Director, Prevention Deterioration Center, National Research Council, Washington, D C. Sponsors: P B Marsh, A E Brown.

*JUNIOR*

*Alex Lamont*—Mgr, Loebl Dyers Inc, Atlanta, Ga. Sponsors: W O Neeb, C W Angline.

*Gloria J Moore*—Chemist, National Inst of Drycleaning, Silver Spring, Md. Sponsors: R T Graham, G P Fulton.

*Eugene Papa*—Text chemist, A D Julliard Co (Division of United Merchants & Manufacturers), New York Mills, N Y. Sponsors: J Dabrowski, A F Gortuai.

*ASSOCIATE*

*Ernest M Cook*—Gen mgr and sales engr, Cook P&N Machine Co, Boston, Mass.

*Richard D Elder*—Vice-pres (production), Joseph M Stern Co, Cleveland, O.

*Alberto Guisard*—Supt, Companhia Taubate Industrial, Taubate, Sao Paulo, Brazil.

*John R Lilley*—Supervisor of dyeing-finishing, Silk Textile Printers Ltd, Tasmania (Australia).

*Russell H Pearson*—Sales repr, Original Bradford Soap Works, West Warwick, R I.

*Barret Silverman*—Colorer-sec-treas, Wilson Tanning Corp, Gloversville, N Y.

*John M Stearns*—Chief engineer, Cook P&N Machine Co, Boston, Mass.

*John D Wingrave*—Chemist-colorist, Silk Textile Printers Ltd, Tasmania (Australia).

*CORPORATE*

*Pyramid Mfg Co, Inc*

*APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP*

*George A Jeandros*

*William L Mathias*

*STUDENT*

*William Choupres*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp

*Lila Frates*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Paul N Gauvin*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*John F Greene, Jr*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp

*Bruce A Gulbranson*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*James W Harrison*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Charles E Hodgkins*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*John P Kondig*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Frank Marco*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Joseph B P Marco*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Raymond N Martin*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*STUDENT*

*Muriel F Meier*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Margaret Mendoza*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Ralph O Moyer, Jr*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*William J Perron*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Patricia A Perry*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Kenneth J Provost*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Roy Serpa*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*William H Sherman*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Mary L Silva*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Augustine Silveira*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Anthony C Teixeira*—New Bedford Inst of Textiles & Technology. Sponsor: F Tripp.

*Morey Kaplan*—Philadelphia Textile Institute. Sponsor: W H Hughes.

*Joseph K Friedrich*—Lowell Technological Institute. Sponsor: G R Griffin.

*Willie E Alford*—Clemson College. Sponsor: J Lindsay, Jr.

*Isam E Ballenger*—Clemson College. Sponsor: J Lindsay, Jr.

*William B Bennett*—Clemson College. Sponsor: J Lindsay, Jr.

*William M Campbell*—Clemson College. Sponsor: J Lindsay, Jr.

*Richard L Hawes*—Clemson College. Sponsor: J Lindsay, Jr.

*Kenneth G Jordan*—Clemson College. Sponsor: J Lindsay, Jr.

*William L Polhemus*—Clemson College. Sponsor: J Lindsay, Jr.

*Richard S Powell*—Clemson College. Sponsor: J Lindsay, Jr.

*DeWitt U Tilley, Jr*—Clemson College. Sponsor: J Lindsay, Jr.

*(Additional Membership Applications on page P29)*

# AATCC CALENDAR

**COUNCIL**

Jan 20 (Hotel Statler, New York, N Y); Apr 20 (Philadelphia, Pa); June 15; week of Sept 10th (New York, N Y); Nov 16; Jan 18, 1957.

**NATIONAL CONVENTIONS**

Sept 13-15, 1956 (Waldorf-Astoria, New York) (as part of the Perkin Centennial. Sept 10-15); 1957 (Boston); 1958 (Chicago); 1959 (Washington, DC)

**HUDSON-MOHAWK SECTION**

Jan 20 (Jack's Restaurant, Albany, NY); March 16 (Hotel Johnstown, Johnstown, N Y); May 18 (Ladies Nite); June 22 (Annual Outing).

**MID-WEST SECTION**

Feb 11 (Bismarck Hotel, Chicago, Ill); May 5 (Plankington Hotel, Milwaukee, Wis); June 16 (Outing—Browns Lake Resort, Burlington, Wis)

**NEW YORK SECTION**

Jan 27, Mar 2 (Hotel Delmonico, New York, N Y); Mar 23, Apr 27, May 18 (Kohler's Swiss Chalet, Rochelle Park, N J).

**NIAGARA FRONTIER SECTION**

Jan 20 (U S); Mar 3 (Canada—meeting to be held in conjunction wtih Ontario Section, CATCC); Apr 27 (U S).

**NORTHERN NEW ENGLAND SECTION**

Feb 17 (U S Quartermaster Research & Development Command, Natick, Mass); Apr 27 (Lowell Technological Institute, Lowell, Mass); Sept 28 (Annual Outing —Wachusett Country Club, West Boylston, Mass); Oct 19 (Science Park, Boston, Mass); Dec 1 (Annual Meeting—Hotel Vendome, Boston)

**PACIFIC SOUTHWEST SECTION**

Feb 6 (Gourmet Restaurant, Beverly Hills, Calif).

**PHILADELPHIA SECTION**

Mar 2 (Adelphia Hotel, Philadelphia); Apr 20 (Benjamin Franklin Hotel, Philadelphia); May 18 (Annual Outing)

**PIEDMONT SECTION**

Feb 4 (Poinsett Hotel, Greenville, S C); Apr 7 (Sir Walter Raleigh Hotel, Raleigh, N C); June 8-9 (Outing — Mayview Manor Blowing Rock, N C); Oct 6 (Annual Meeting—Hotel Charlotte, Charlotte, N C)

**SOUTHEASTERN SECTION**

Feb 18 (Auburn and Pepperell, Ala).

**WESTERN NEW ENGLAND SECTION**

Jan 27, Mar 16 (Rapp's Restaurant, Shelton, Conn); May 11 (Ladies' Night—Waverly Inn, Cheshire, Conn); June 15 (Outing); Oct 5 (Annual Meeting—Hartford, Conn); Nov 16 (Rapp's Restaurant, Shelton, Conn)

# ACTIVITIES OF THE LOCAL SECTIONS

PHILADELPHIA —— The Educational Committee of the Philadelphia Section will sponsor a new lecture series on "The Application of Vat Dyes", beginning March 5th at 7:30 pm at the Philadelphia Textile Institute, Germantown, Philadelphia, Pa. The series will consist of five consecutive 2-hour lectures on Monday evenings, running through April 9.

Lecturers will be recognized men in the field of vat dyeing, who will use as a text AATCC Monograph No. 2, "The Application of Vat Dyes". The class will be limited to 35. Tuition will be $15.00 for AATCC members and $18.00 for non-members. The additional $3.00 for non-members will be applied to dues payments if they wish to become AATCC members.

The speakers in order will be: Paul L Meunier, manager, sales development, Dyestuff Div, E I du Pont de Nemours & Co, Inc; Sumner H Williams, vice president and general sales manager, General Aniline & Film Corp; R Stewart Wilkinson, assistant professor of dyeing and finishing, Philadelphia Textile Institute; Raymond W Jacoby, consultant, Ciba Co, Inc, and president, AATCC; Hans Luttringhaus, Progressive Color & Chemical Co, Inc.

Reservations may be made by sending a check to the Educational Committee, Philadelphia Section, AATCC, PO Box 5025, Philadelphia 11, Pa.

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SOUTHEASTERN —— The December 3rd meeting of the Southeastern Section, held at the Atlanta Biltmore Hotel, Atlanta, Ga, featured a discussion of all phases of merchandising and the dyeing of mercerized piece goods.

The discussion was led by Sidney M Edelstein, Dexter Chemical Corp. It was based on problems connected with mercerizing, which had been written up and sent in by members of the Section ahead of the meeting. The dyeing and variations in dyeing of mercerized goods came in for major discussion, with Mr Edelstein pointing out chemical changes in cotton in mercerizing to make it hold up to 60% more dyestuff per unit of weight. He stated that mercerized cotton has greater dye affinity, and that it will show up darker with the same amount of dyestuff. The audience was cautioned to look at the washing for the cause of most dyeing variations on mercerized material, as this is a critical point. Relative to mercerizing of piece goods, Mr Edelstein discussed penetrants, proper control of tentering, and importance of using sufficient caustic.

Additional highlights of the meeting included the announcement and introduction of new officers for 1956, an address by F J Schwaemmle of Delta Air Lines, and the introduction of Russell A Waters, first beneficiary of the Section's Scholarship Fund

**SOUTHEASTERN SECTION OFFICERS FOR 1956**

***Seated*** **(l to r): William E Fayssoux, Royce Chemical Co, treasurer; James W Swiney, Fulton Bag & Cotton Mills, chairman; William B Griffin, Dexter Chemical Corp, vice chairman; Edward R Ravenel, Morton Salt Co, secretary.**

***Standing*** **(l to r): Roger L Gili, Pepperell Mfg Co, sectional committeeman; Francis X Nerney, Becco Chemical Div, sectional committeeman, William F Kennady, Arnold, Hoffman & Co, Inc, outing chairman; William B Amos, Stein, Hall & Co, Inc, corporate membership chairman; Robert B Hallowell, Clark Thread Co, councilor; A Kempton Haynes, Rohm & Haas Co, custodian.**

**Absent when photo was taken were S Jack Davis, The Chemstrand Corp, councilor; Marc V Shivers, Thomaston Mills, sectional committeeman; and James M Buckner, Muscogee Mfg Co, sectional committeeman.**

**Smiles are in order as Russe'l A Waters of Sylvania Co, a student at Georgia Institute of Technology, receives a $500 check from H Gillespie Smith, chairman of the Southeastern Section's Scholarship Committee, at the Dec 3rd meeting of the Section in Atlanta. Mr Waters is the first beneficiary of the Section's newly created Scholarship Fund. Looking on is Howard T McCamy, chairman of the Section at the time.**

and a student of textile chemistry at Georgia Tech.

Presiding at the meeting as well as at the dinner following was Max Ferguson, National Aniline Div. At the dinner, Mr Edelstein presented a check, which had accrued from an article he had authored, to H Gillespie Smith, head of the Scholarship Committee.

The Southeastern Section's first meeting of 1956 will be held February 18 as a combined plant and school meeting at Auburn and Pepperell, Ala. James P Farrow, professor of textile chemistry and dyeing at Alabama Polytechnic Institute, Auburn, Ala, and Roger Gill, Pepperell Mfg Co, Pepperell, Ala, sectional committeemen, are cooperating on this meeting.

## EMPLOYMENT REGISTER

*This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.*

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*Education:* BTC, textile chemistry & dyeing, with honors.

*Experience:* supt & asst manager, dyeing and finishing.

*Age:* 45; married; references from all employers; location, in U S, not essential.

1-16, 1-30

# MEMBERSHIP APPLICATIONS

December 30, 1955

*SENIOR*

*Octavian Bota*—Textile colorist-dyer, The Esmond Mills Co, Granby, Canada. Sponsors: A A Mailloux, E Parker.

*Atys C Bowles*—Raw stock dyer, J P Stevens & Co, Inc, Dublin, Ga. Sponsors: A Coates, B C Kotyla.

*Robert J Dinan*—Supt, J P Stevens Co, Inc, Dublin, Ga. Sponsors: T D Bruce, J A Smyth.

*Clyde C Lane*—Assistant to chemist, Lanett Bleachery & Dye Wks, Lanett, Ala. Sponsors: L L Bamberger, A K Haynes.

*Johnny Y Lee*—Overseer dyeing, Dublin Mills, Dublin, Ga. Sponsors: K D Henry, H L Thomas.

*Evan A Taylor*—Textile engineer, Dublin Plant, Woolen & Worsted Div, J P Stevens & Co, Inc, Dublin, Ga. Sponsors: T D Bruce, J A Smyth.

*JUNIOR*

*Norman H Russo*—Technical service, National Aniline Div, Allied Chemical & Dye Corp, New York, N Y. Sponsor: W A Holst.

*ASSOCIATE*

*Thomas P Hatchett*—Asst supt, J P Stevens & Co, Inc, Dublin, Ga.

*Neal W Lynn*—Second hand, raw stock dyer, J P Stevens & Co, Dublin, Ga.

*Erneste Stock*—Chief-partner of Espal Repr & Conta Propria Ltda, Rio de Janeiro, Brazil.

*CORPORATE*

*Firth Carpet Co*
*Warwick Mills*

*APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP*

*Joe H Schell*

*STUDENT*

*Gerald J Doucet*—Bradford Durfee Tech Inst. Sponsor: J Watters.

*Robert Halshaw, Jr*—Bradford Durfee Tech Inst. Sponsor: J Watters.

*Alam Mahboob*—Bradford Durfee Tech Inst. Sponsor: J Watters.

*Rene J Marois, Jr*—Bradford Durfee Tech Inst. Sponsor: J Watters.

*Ray H Medeiros*—Bradford Durfee Tech Inst. Sponsor: J Watters.

*Robert J Nestor*—Bradford Durfee Tech Inst. Sponsor: J Watters.

*Robert Plourde*—Bradford Durfee Tech Inst. Sponsor: J Watters.

*Ronald A Fisher*—R I School of Design. Sponsor: H B Sturtevant.


## *AATCC Monograph No. 2*

# "THE APPLICATION OF VAT DYES"

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*1955 National Convention——*

# A STUDY OF RAYON IN TUFTED CARPETING*

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Data are presented relative to the dyeing and finishing of 100% rayon and rayon blended with nylon, acetate, and wool in tufted carpeting. Factors which the dyer must consider in piece dyeing and stock dyeing with direct or vat dyestuffs are discussed along with test methods and end-use specifications. Some emphasis is placed on the necessity for dyestuff selection as related to fastness requirements, level dyeing, and suitability to withstand carpet cleaning and spot-removal techniques. Causes of warp streaks in rayon carpeting are given and methods of isolating some causes described.

Current interest in new dyeing and finishing equipment and methods is reviewed. Included also are data on the general use and value of soil-resist treatments and information concerning discoloration in finished carpeting.

## INTRODUCTION

THE widespread growth and popularity of rayon carpeting is unquestionably due to the development of a new industry segment, that of tufting. This in turn has brought about required ancillary developments, such as back coating with latex for locking in the tufts as well as adding other helpful characteristics. In order to take advantage of the new low-cost method of manufacturing carpeting it was necessary to seek a fiber which would be 1) low in cost, 2) in plentiful supply, and 3) have a stable price structure. In addition, it must possess the necessary fiber characteristics which would satisfy the carpeting industry, such as toughness, strength, and resiliency. These requirements have been met by rayon. Prior to the development of tufted carpeting, the rayon industry developed fibers for use in the woven carpet field which proved themselves satisfactory in blends with wool. These were 8- and 15-denier crimped staple and are the fibers which, today, constitute the backbone of the rayon-tufted-carpeting industry. They are made in both bright and dull lusters and are used either alone or in blends with each other. A popular blend at the moment is 8-denier bright with 15-denier dull. The selection of these fibers is basically dependent upon the yarn to be spun as well as the appearance and texture of carpeting desired by the individual manufacturer.

The development of tufted rayon carpeting has in its turn brought about changes in carpet-finishing techniques. For example, the great proportion of this carpeting is piece dyed, contrasting with the conventional woven carpet which is overwhelmingly stock dyed. This in itself has required signal changes in existing equipment as well as the development of new machinery not only for dyeing but for drying and other handling. The simple matter of changing normal piece-dyeing widths from approximately five feet to eighteen feet has brought about many complex problems of machine construction.

Some of the more obvious problems resulting from the piece dyeing of carpeting are: side to center shading, end to end shading, and streaky dyeings; some problems introduced as a result of the use of rayon and synthetics in piece dye are; streaks caused by improper blending in spinning, yellowing under adverse conditions of both dyeing and drying, and water spotting. In finished carpets, spotting and soiling problems arise and antisoiling procedures as well as spotproofing possibilities are receiving considerable attention. In addition to the above it is necessary to devise test methods, to set up standards of quality, to determine soil-resistant properties, and to evaluate soil-retardant materials. All of the above have evolved in the past five years and the growth of this industry has been so rapid that it has not been possible to keep abreast of the problems involved. Nevertheless, a great deal has been accomplished, and it is the purpose of this paper to outline the work already done in this field with a brief summary of current problems, suggested test procedures, and a general discussion of antisoiling and antispotting media.

## DISCUSSION

The great majority of carpeting is made from either 100% rayon in blends of 8- and 15-denier bright and dull or blends of rayon with a minor amount of nylon, usually not exceeding 10% and more often 6% or less. Generally no attempt is made to dye the nylon content, although in some cases the nylon dyes with the direct colors. This at times is a cause for streaks. This will be dealt with more fully later.

There are some blends of rayon with acetate, which are used mostly to obtain special color effects. Rayon-wool blends are currently receiving attention and blends of rayon with Dacron, Orlon and Acrilan are being explored with a view to obtaining special textures and to add characteristics for improved resilience.

Almost all rayon carpeting comes to the dyer with the pile yarn tinted. This is done to avoid mixed lots during spinning. The tints must be carefully chosen so as to be easily removable during dyeing regardless of fiber content and method of dyeing. This also will be discussed later in more detail.

The piece dyeing of rayon carpets is usually accomplished at open width in conventional-type dyeing machines using procedures as outlined by Woodruff *(1)*. New machine developments in piece-dye technique are either currently under development or so new that it is not possible to evaluate them at present. They are of two types: 1) the conventional dyebeck equipped with pumps for improved dye circulation, and 2) the pressure-type dyeing machine being made by the Burlington Engineering Company. One of these machines is in plant use and is proving of merit. The Barotor is in test use but knowledge of this is too limited for beneficial discussion. In contrast to these batch processes, the Niptrol padder, which is used in conjunction with either a water booster or a steam ager, is a promising new continuous development. Laboratory tests made so far indicate that the Niptrol has considerable promise, especially with regard to wide-width carpeting. It offers equalized pressure along the top roll,

* Presented by W S Sollenberger before a Symposium on Dyeing and Finishing held September 24, 1955 in the Viking Room of the Haddon Hall Hotel, Atlantic City, N J.

thus, theoretically at least, ensuring an even squeeze across the whole width of the carpet. As in any other type of fabric dyeing, a continuous system, all other things being equal, holds more possibilities than a batch process for reasons of economy, speed, and efficiency. In addition, continuous systems lend themselves to vat-dyeing techniques.

At the moment practically all rayon carpeting dyed with direct colors because of their ease of application as well as for the fact that their fastness characteristics are satisfactory if the colors are well selected. Dyes should be chosen to give 20 hours light fastness for light-to-medium shades and 40 hours for dark shades, wash fastness, at 120°F, and resistance to spotting by liquids commonly spilled on carpets. They should also be selected for maximum leveling. Sometimes it may be necessary to sacrifice some fastness in the interest of good dye coverage. A list of such colors has been compiled by the staff of the Textile Research Department and is available on request. Of course this list is being constantly revised.

Because of the latex backing on carpets, dyes must be selected which are effectively copper free. Although direct dyes currently are satisfactory, there is interest in the maximum fastness provided by vat colors. Because of the limitations of present dye equipment it is not possible to vat dye piece goods, at least not without a great deal of risk, but interest is growing in the use of spun-dyed colors and of vat colors in stock dyeing. It can be realized that stock dyeing or spin dyeing greatly enlarge the scope of the carpet designer constructionwise and eliminate some present problems with piece goods. However, they add to manufacturing expense and present inventory difficulties. Because of this their general acceptance will be strongly contested in this case. Where carpeting can be piece dyed, improvements or developments of machinery for vat piece dyeing will be of great interest to the dyer and tufter.

After being dyed the carpeting is either vacuum extracted or squeezed, or both, after which it is beaten to restore texture and dried. It is felt that current equipment for extracting moisture is not satisfactory because too much moisture is left in the carpet to be dried. Most extractors today leave approximately 100% moisture in the carpet, which requires long exposures at high temperatures for drying, and carries with it problems of side-to-center shading, yellowing and water spotting. If extracting could be brought within a 70%-moisture-content range, lower temperatures as well as shorter times of drying would be accomplished. This would be very helpful in minimizing side-to-center shading and any yellowing which can be traceable to overexposure at high temperature. In addition there would be a valuable saving in steam.

We will now discuss some problems connected with the dyeing and finishing of viscose carpeting and the methods developed for identifying them as well as helping with their solution.

DISCOLORATION AND WATER SPOTTING———The causes of discoloration have been discussed but they certainly are important enough to bear further elaboration. Primary causes of discloration, which are three in number, have been found to result from inherent impurities in one of the carpet components or from the formation of cellulose degradation products in the pile as a result of finishing technique. It has been shown that unwashed backing fabrics of either jute or cotton contain large amounts of discolorants, which may migrate to pile tips on drying. This is particularly true of stock-dyed carpeting, which normally does not receive a sufficient amount of wet treatment to remove these impurities from the backing fabric. Fortunately, however, most of these fabrics in use today are relatively oil free and clean. Conversely, piece-dyed carpeting will seldom show discoloration or spotting as a result of the backing-fabric impurities because, during the normal scouring and dyeing operations, these impurities are sufficiently removed.

Possibly the principal source of discolorants in rayon carpeting, and one which will affect "piece-dyed carpets" as well as carpeting made from dyed stock, is that of overdrying. The amount of discoloration produced by overdrying is a function of the time and temperature of drying and of the pH of the carpet during the drying operation. Drying at a high temperature for a relatively long period of time may produce pronounced discoloration. Very closely related to the effect of overdrying is the pH at which drying is done. When it is done at an alkaline pH of from 8 to 9, discoloration may certainly be accentuated; however, when it is done in a slightly acid condition, discoloration resulting from overdrying is minimized.

To illustrate these effects, individual "dyeless-dyed" samples of carpet have been rinsed in solutions of acetic acid at pH 5.5, distilled water at pH 6.9, and tetrasodiumpyrophosphate at pH 9.6. All were dried at 300°F for 20 minutes, which was just sufficient time to permit 3 to 5% moisture to remain in the fabrics. These samples show very clearly that the acid rinse has successfully eliminated discoloration while the neutral through the most alkaline samples show progressively increased yellowing. It has been proven definitely that an acidic rinse as a final operation prior to drying is very good insurance against discoloration.

In piece-dyed carpeting, discoloration may be uniform over the entire carpet as a result of uniform overdrying or it may be nonuniform because of inefficiencies of the particular dryer. This is frequently noticed along the outside edges of carpets, and when side-to-center-to-side shading is a problem it is well to look at the drying operation as well as the dyeing procedures as being a contributing factor. Similarly, nonuniform extraction of the carpeting prior to its entering the dryer may result in discoloration during drying because those areas which have been extracted most will dry more quickly than those areas containing larger amounts of water. The carpet dried in a neutral or slightly alkaline condition can be objectionably discolored if exposed for 5 to 10 minutes at 300°F after the moisture content has been reduced to 1 to 3%. Portions of the samples described above as rinsed in solutions of acetic acid, distilled water, and tetrasodiumpyrophosphate were dried at 300°F for 30 minutes or 10 minutes longer than the previous set. This was sufficient time to bone dry the fabrics and result in noticeably more discoloration than on those samples dried for 20 minutes. Actually this added drying time was adequate to cause some slight yellowing in even the acid-treated sample, but the relative order of the other samples is as mentioned previously. Rayon carpeting prepared from overdried stock dye may also show pronounced discoloration, usually nonuniform, during finishing. If carpeting is wet or steamed during finishing to obtain the desired texture, an opportunity is inadvertently provided for the discolorants to wick to wet and dry interfaces during the subsequent drying operation.

To eliminate or minimize the tendency toward discoloration during drying, it is suggested that piece-dyed carpeting or raw stock be given an acidic rinse prior to drying with materials such as acetic acid, boric acid, or aluminum acetate. The amounts of these materials used to obtain a pH of 5.5 to 6 will be satisfactory. It is well to note here that those direct dyestuffs which do not show an acid sensitivity should be used so as to avoid drastic shade changes. Drying temperatures in excess of 300°F are to be avoided, and the elimination of nonuniform drying by improving circulation within the dryer will aid in minimizing the formation of discolorants. Carpeting taken from the dryer with a uniform 5 to 10% moisture content rarely will show indications of cellulose degradation products if dried in neutral or slightly acidic conditions.

The results of overdrying cannot be stressed too strongly, as this may take the form of a uniform discoloration and so will not be noticed by the manufacturer. In this case, the fault will be found by the consumer when any liquid, even water, is spilled on the carpet or home spotting techniques are applied. The result will be a yellow-brown ring——a serious complaint against rayon carpets. It might be mentioned here that alkaline spotting solutions tend to accentuate ring discoloration while acidic solutions minimize it. The slow drying, which is normal to household conditions, will itself accentuate migration of these colored materials to the wet and dry interfaces.

Portions of samples prepared to illustrate the effect of pH and drying time and temperature were wet in one location with 50 cc of water and dried at 90 to 100°F. This is a simple procedure which may be used successfully to detect the presence of discolorants by their migration to form a brown stain. It is evident that the acid-rinsed and not-overdried samples show no water spotting while all other samples show a stain. Severity of water spotting increases with increases in pH and although the relative order is the same, the overdried samples show the more pronounced spotting.

To re-emphasize the above points it can be said that two cardinal factors apply to the control of rayon-carpet-finishing techniques. *First*, the pH of the carpet must be controlled so that it leaves the bath at pH 5.5 to 6. Experience has shown that in the average carpet-dyeing machine this will require approximately 30 minutes. *Second*, proper control of temperatures and times of drying; ie, 270° to 290°F to leave a uniform 5 to 8% moisture in the carpet when it leaves the final drying.

SOIL-RESIST TREATMENTS ——— Much has been said recently, pro and con, in reference to the effect and value of soil-resistant treatments on rayon carpeting. It is realized that rayon carpets show a greater tendency toward soiling than wool carpets and that soil-resistant treatments probably offer most to the synthetics in general. This is true not only because of fiber properties, but also because of present trends toward the use of very light shades, which naturally show soil readily. None of the presently used treatments form a permanent soil barrier but they can retard soiling to the degree that it will not be apparent in an objectionably short time.

The best of these materials at present are based on colloidal silica or other metallic oxides, of particle sizes in the range of 0.1 to 10 microns. They do their work by forming a film or coating over the fiber and by filling in the serrations common to many cellulosic fibers. A recent evaluation of some of these materials has shown that they are effective to the degree that they can reduce the soiling rate of a crimped viscose fiber to the point where it is equivalent to that of the untreated smooth rayon fiber.

The application of these materials is not without its troubles. They are generally applied in a final rinse or by padding or quite frequently by spraying onto the wet but extracted fabric prior to entering the drier. Quite naturally, a uniform application is essential, otherwise nonuniform soiling will result.

Improper application may cause dusting, that is, the fine particles of soil-resist materials do not adhere properly to the fiber or are present in too great a quantity and a slight agitation of the pile fibers causes them to "dust off" into the atmosphere.

Another frequent criticism of the use of soil-resistant treatments is that of their harshening effect. It is only natural that, when these materials are applied, they will tend to dissipate the natural softness of most synthetic and natural fibers. Several of the preparations offered today have "built-in" softeners, which appear to be adequate. However, some carpet manufacturers, who have claimed use of soil-resistant materials, have actually found it necessary to compromise soil resistance for reduced harshness. In other words, the amount of soil-resistant material applied has been reduced to the point where it is of little value, but the effect on the hand of the finished fabric is not objectionable. The natural and logical approach to overcoming this latter problem is that of adding softeners as an adjunct to the soil-resist treatment. Many softeners, as might be expected, will increase soiling rather than aid the soil-resist treatment, but there are some materials available which aid the antisoiling properties of the treatment and at the same time add an acceptable degree of softness. Some of the cationic softeners, for example, appear of value in this connection, but are not generally usable because of their adverse effect on light fastness of direct dyestuffs. This, however, does not preclude their use with soil-resist treatments on vat-dyed carpeting.

There have been many soiling test methods proposed in recent years, both for mill control and evaluation of soil-resist treatment. Possibly the best approach to soil testing is that of actual service soiling, but this method has the disadvantages of requiring too much time and not enough positive control. For the quick evaluation of soil-resistant treatments, a simple accelerated method has been in use in our laboratories. It may be accomplished in a very short time, it is relatively accurate, and correlates quite well with service soiling methods. The test requires an 8"-long sample taken in the direction of tufting and 3" in width, a salt shaker or similar device, a synthetic soil or other well-controlled soiling medium, a set of squeeze rolls or laboratory padder, and a vacuum cleaner. The test is conducted by shaking from the salt shaker 0.8 gram of soil onto the fabric in a manner so as to evenly distribute the soil over the entire sample. The sample is then folded in half to give a 4" x 3" dimension and in this folded condition is patted twice on one side, turned over and patted twice on the other side with the opened hand. The sides are alternately reversed and given five pats between each reversal for a total of ten cycles. The sample is then passed four times through a padder in the direction of pile lay at 40 psi. Vacuuming is done with a narrow slotted attachment, which is moved five times across the length of the sample in each direction. The resultant sample is then ready for spectophotometric or visual evaluation. As mentioned above, this simple test appears to correlate well with service testing and has the advantage of being accomplished in approximately five minutes with commonly available equipment.

TINT SELECTION———As previously mentioned, a careful selection of tint must be made, giving consideration to the fugitivity of the tint on both the rayon and nylon components of the blend.

A number of tints fugitive on rayon under all dyeing conditions are not applicable to rayon/nylon blends because they are either absorbed by the nylon during the tinting and subsequent drying and are not removed from the nylon during dyeing or they are absorbed by the nylon during dyeing after being released by the rayon.

Variations in nylon content, which would not be apparent if the nylon were undyed or lightly stained the same shade as the rayon, will result in streaks when the nylon is dyed a shade contrasting to the rayon as a result of improper tint selection.

Since most normal dyeing practices do not include prescour to remove the tint and also since the majority of carpeting includes blends with nylon, it is necessary to test the fugitivity of the tints under dyeing conditions without the removal of the tint prior to dyeing.

Such a test method is as follows:

Prepare a water solution of tint.

Immerse samples of rayon and nylon in the tint solution for 5 minutes at room temperature.

Squeeze out excess and dry.

Dye samples of tinted stock with 0.1% Yellow NN (*CI* 814) plus 1.0% each of detergent, TSPP and Calgon. Enter stock at the boil and run for 15 minutes, then add 1, 2, 4, 8% salt at intervals of 5, 5, 10, 15 minutes. Rinse stock for 20 minutes in water at 100-110°F.

Compare samples visually for staining against untinted stock dyed in a like manner.

For yellow tints, substitute Blue RRL (*CI* 319) for Yellow NN, or, if preferred, exclude the dyestuff and run the dyeing cycle only with the necessary auxiliaries.

It is essential that the tints selected be fugitive to all fibers contained in the carpeting.

STREAKS——The source of all streaks in tufted carpets is not clearly understood; however, it is known that streaks can be caused by factors from raw materials through dyeing procedures.

Unintentional blending of different lots of rayon staple, nonuniform blending of rayon and nylon or the bright and dull components in the yarn, nonuniform blending of different deniers, improper tint selection, and finish application have all been found to contribute to streaks. Likewise, variations in yarn count or twist or the use of wet spinning methods are often responsible.

The influence of tufting-machine components is not to be overlooked. Improper needle and cutting-knife alignment and dull cutting knives may result in apparent streaks, which are usually impossible to correct.

Dyeing technique and dye selection play a major part in streak elimination in piece-dyed carpeting. Many instances of streaky goods have been corrected by a changed dye technique and by improved color selection.

It is recognized that, as the tufting industry has grown in experience, many of the abovementioned causes of streaks have been eliminated and complaints on streaks among the more experienced manufacturers are much less than formerly. The less experienced still encounter these problems to a degree, which gives us concern, and the carpet technician still has a great deal of educating to do.

The following procedure is usually followed by our laboratory when streaky carpets are brought to our attention.

Enter the goods into the dyebath containing the necessary deystuff plus 1.0% each of detergent, water softener and TSPP at 200°F and run for 15 minutes.

Add salt:

1.0% run 5 minutes
2.0% run 5 minutes
4.0% run 10 minutes
8.0% run 15 minutes

Rinse and dry.

This method frequently shows significant improvement, and a change in dye technique is suggested to overcome streaks. Its value has been substantiated in numerous mill trials. However, while this approach promotes leveling and is generally the most satisfactory method for dyeing tufted rayon carpets, there are cases where streaks still result.

Therefore, an adjunct to this dyeing technique is the use of dyestuffs selected for their leveling properties on rayon carpet staple. A list of these dyes has been discussed by Woodruff *(1)*. In all but a few instances the combination of dyeing method and selected dyestuffs has resulted in commercially acceptable carpeting.

The method in use for testing dyestuffs for their level dyeing characteristics follows.

0.1% and 0.5% dyeings are made on one-foot squares cut from rayon carpeting tufted by alternating six needles each of two lots of rayon between which there is a grey scale grade 4 dye index difference when dyed with Sky Blue FF. The method outlined previously is used for the dyeing.

The carpets are then inspected visually, and dyestuffs which reduce dye index difference from grade 4 to grade 1 or less are considered level dyeing.

A factor that must be remembered in dyeing blends of rayon and nylon is that improper dye selection can result in the nylon being dyed a shade that contrasts with the rayon because of the selective absorption of one or more components of the dyebath by the nylon, thus emphasizing blend variations. Dyeing neutral or slightly acid rather than at an alkaline pH tends to promote absorption of certain direct dyestuffs by the nylon. The result is the narrowing of the limits within which the nylon content of the blend may vary without causing streaks.

Streaks resulting from nonuniform blending where the nylon is undyed may be eliminated by dyeing the nylon with the acetate dyes to match the rayon.

## CONCLUSION

From the foregoing remarks it may be seen that a great deal has been accomplished, but there is still a great deal to be done. It should not be construed from this outline that rayon carpet manufacturers are in constant hot water. Not only is a great proportion of rayon carpeting satisfactorily manufactured and processed, but it is giving sound consumer satisfaction. The scope of the tufting machine is widening and it will provide a much wider variety of designs than hitherto. It may be expected that machinery will be developed to provide faster dyeing at relatively low cost. Spinning techniques will be perfected and rayon fibers in present use will be improved upon or new ones will be developed.

Present demand for carpet fiber as well as that in the foreseeable future cannot be met exclusively by wool. Therefore, the future outlook for rayon in this field is extremely good, and as improvements are developed the use of rayon should grow steadily, thus providing good carpeting in unlimited quantity at low cost.

## REFERENCE

*(1)* Woodruff, J. A, "Dyeing and Finishing Rayon Tufted Carpets", *Am Dyestuff Reptr* 44, P636 (1955).

## QUESTIONS AND ANSWERS

*Question:* Have you, in connection with your acid treatment, utilized common salt or Glauber's sale in that work?

*Answer:* No, we have not used it as a separate treatment. Do you mean in place of the acidic rinse?

*Q:* In combination, yes, or with the acid.

*A:* We have not used salts in combination with the acid, but we know that common salt will not limit the formation of discolorants of this type.

*Q:* Would the Glauber's salt make a distinct difference?

*A:* We have found that once degradation products are present as a result of overdrying at an alkaline pH there is little one can do to limit that migration if the carpet is wet locally.

*Q:* But do you think that the inclusion of either one of the salt additions would be of any value in reducing migration?

*A:* I don't think so. As mentioned, once the material is there, the only thing you can do is scour the carpet and dry it at a lower temperature so that it is not overdried. An acidic rinse is added insurance against discoloration.

*Q:* In your evaluation of the tints, did you age any of those semidyed materials with a fugitive tint or not?

I will elaborate. We have found that, with a number of the fugitive tints, it is necessary to give them an aging, such as is achieved when the goods are stored in the warehouses, before they are evaluated.

We have developed an accelerating aging that seems to tie in with that in which, after the goods have been tinted and air dried, they are suspended in a closed beck with steam for 20 minutes. Some tints that seem to be fugitive initially are not, after that treatment.

*A:* The test does not include an aging period. It is difficult to design an accelerated treatment which would be truly representative of all aging conditions. However, the accelerated method which you mention could be incorporated in this test for fugitivity.

***Philadelphia and Mid-West Sections——***

# CONSIDERATIONS IN DYEING ACRILAN*

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If a new man-made fiber is to be accepted for general use in the textile industry, claims the author, it must be dyeable in a complete range of shades of adequate fastness properties. Acrilan acrylic fiber, which finds use both alone and in blends with wool, cotton, rayon, nylon, Dacron, and silk, has been designed to be dyed with eight different dyestuff classes. The application of these on textiles of 100% Acrilan acrylic fiber and also on blends with natural or other man-made fibers is discussed. Especially important is the use of cation-active dyeing assistants to provide transfer of dye from wool to Acrilan acrylic fiber in blends of the two to produce piece-dyed union shades using wool dyestuffs for both fibers.

## INTRODUCTION

THE advent of the newer synthetic fibers originally presented, and still is presenting, a tremendous challenge to the skill, patience, and ability of the textile dyer and colorist, to which he has responded magnificently. It is very doubtful, however, whether the art and science of new-fiber dyeing would have advanced to the present position had not new dyestuffs and entirely new dyeing techniques been developed by those people whose function it was to study the purely fundamental aspects of new-fiber dyeing. After several years of plant and laboratory experience, some of these techniques have failed to meet the acid test of practicability, while others have been accepted by the dyer after a period of challenge and trouble, which finally gave way to success.

The course of events in textile dyeing has made it mandatory that, if a new fiber is to be accepted on a wide end-use basis, irrespective of its aethetic or functional properties, it must be dyeable without restriction in a complete range of shades not only in 100% form but in blends with natural and other synthetic fibers. Acrilan acrylic fiber is now in full-scale production for use in such diversified fields as blankets, sweaters, sports shirts and wash-and-wear garments in 100% form; in blends with wool and worsted to produce a wide variety of slacks and suiting fabrics; in blends with cotton to produce acid-resistant work clothing; and in blends with Dacron, silk, acetate, viscose, and nylon to produce a wide variety of novelty fabrics. This is ample evidence of the flexible nature of Acrilan dyeability and of the acceptance of Acrilan by dyeing technicians. The fact that Acrilan is readily dyeable with eight different classes of dyestuffs has contributed materially to the great variety of its end uses, particularly in view of the fact that the dyeing techniques that have been developed differ only to a minor extent from those that have been used for the natural and older man-made fibers.

A glance at Table I shows the classes of dyestuffs that can be used on Acrilan in comparison with natural and other man-made fibers old and new.

Having thus heard of the flexible nature of Acrilan dyeing, you will logically ask the question: "What is the value of the use of a multiplicity of differing dyestuff types?" As this talk progresses, the answer, it is hoped, will become self-evident.

It is proposed to break down the discussion of the various dyeing techniques into as many subdivisions as time will allow, and the first is 100% Acrilan in sweater form.

## DYEING 100% ACRILAN

Sweaters of 100%-Acrilan-acrylic fiber have been dyed in considerable volume during the present season. In the main, four different dyeing techniques have been employed to cover a wide range of shades from pastel to black involving the use of basic dyes disperse (acetate) dyes, mixtures of these two, and metalized-acid dyes.

BASIC DYES———Basic dyestuffs are normally employed on Acrilan for the same purpose that they were originally used on cotton — brilliance of shade — but with fastness superior to that on cotton, and, although possessing excellent build-up properties on Acrilan, for reasons of economy disperse (acetate) dyestuffs are normally used outside the brilliant pastel-shade area. The method of application and the mechanics of dyeing differ from those of other acrylics in that there does not appear to be any critical temperature range where a rapid strike takes place. The normal practice, after the goods have first been scoured with a nonionic detergent, is to set the dyebath with 5% ammonium acetate and 0.5% Igepon T Gel, both owf. The dyestuff, previously dissolved in alcohol, is added to the bath at 120°F, and the temperature is raised to the boil over 45 minutes. Since the rate of dyeing is gradual, retarders have not been found necessary in most cases. Completion of the dyeing is usually effected in 30 minutes. As is conventional with acrylics, it is essential that the goods be cooled slowly through 175°F to avoid the formation of crack marks.

DISPERSE DYES———Disperse dyestuffs are the work horses of Acrilan-sweater dyeing and can be employed in shades from pastel to black. Although all

TABLE I

COMPARATIVE DYEABILITIES OF NATURAL AND MAN-MADE FIBERS BY SIMPLE METHODS

| *Fiber* | *Disperse* | *Direct* | *Chrome* | *Neutral Metal-ized* | *Neutral Acid* | *Metal-ized* | *Sol Vat* | *Basic* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| Acrilan | X | X | X | X | X | X | X | X | 8 |
| Acetate | X | | | | | | | | 1 |
| Rayon | | X | | | | | X | X | 3 |
| Wool | | X | X | X | X | X | X | | 6 |
| Nylon | X | X | X | X | X | X | | | 6 |
| Polyesters | X | | | | | | | | 1 |
| Other acrylics | X | | | | | | | X | 2 |

* Presented before the Philadelphia Section on October 21, 1955, and before the Mid-West Section October 29, 1955.

disperse dyestuffs will dye Acrilan, it has been necessary to search carefully for those giving optimum colorfastness in relation to build-up ability. The search for a light-fast blue element was initially unrewarding, but it was eventually found that Amacel Violet Blue FSI would provide lightfastness of 20-40 hours in shade depths of 0.1-2.0%. Above this depth a number of disperse blues are completely satisfactory for sweater uses. Celliton Fast Yellow GGLL-CF provides both the best colorfastness and build-up power in the yellow area. Other disperse (acetate) dyestuffs with high build-up potential are the Orange GR type, Celliton Fast Black BTNA, and Celliton Navy Blue BRA. The red element is provided for by the use of Celliton Pink RFS and Celliton Fast Pink FF3B.

The selected disperse dyestuffs are applied at 205°F or above in the presence of minimum amounts of nonionic dispersers. Because their rate of dyeing is relatively slow, they produce dyeings of excellent uniformity. The disperse dyestuff is added to the dyebath at 120°F, the temperature is raised to the boil over 30 minutes, and, in the case of blacks or dark shades, boiling is continued for 2 hours. Heavy dyeings are scoured at 120°F with a nonionic detergent and TSPP to remove unaffixed dyestuff. Shades produced with disperse (acetate) dyestuffs are usually fast to a 140°F washtest.

Mixtures of disperse and basic dyestuffs have been found most effective for such bright and heavy shades as Kelly Green, Jockey Red, etc. The only point requiring special attention is that the dyestuffs be dissolved and added to the dyebath separately. Five percent ammonium acetate is employed to control the pH at 5.5, which appears to be optimum for this type of operation. A post dyeing scour at 120-140°F in nonionic detergent produces dyeings of excellent washfastness.

METALIZED DYES———Although disperse (acetate) dyestuffs will dye Acrilan in shades from pastel to black, there are those who prefer to use metalized dyestuffs for medium to dark shades, the advantage lying in reduced cost as compared with disperse types. The method is substantially the same as for wool dyeing, the dyebath being set with 3% Palatine Salt O and 3% formic acid at 120°F owf. The temperature is raised to the boil over 30 minutes, when 3% sulfuric acid is added and boiling is continued for a further 30 minutes. An additional 3% sulfuric acid is then added, and the dyeing is allowed to continue for 60 minutes. Excellent exhaustion is obtained and the costs of dark shades are relatively inexpensive with metalized dyes. At the conclusion of the dyeing operation the goods are cooled slowly, rinsed, neutralized thoroughly with sodium bicarbonate, and scoured for 15 minutes at 120°F. Acrilan processed in this way has lightfastness and washfastness of a high order.

ACID DYES———Acid dyestuffs may also be employed in the dyeing of heavy and bright shades by the techniques outlined for metalized dyestuffs. The use of sulfuric acid provides full fiber penetration even though weak acid may be sufficient for exhaustion purposes. Neutralization after dyeing is important in the preservation of the naturally soft hand of the Acrilan. Acid dyestuffs, for the most part, are deficient in alkaline perspiration fastness, as is frequently the case on wool.

SPECIAL CASES———Turning now to the piece dyeing of 100% Acrilan fabric for men's wear where lightfastness is of greater importance than for sweaters, we consider four different techniques. Lighter pastels are dyed in the presence of ammonium acetate with special basic blues like the Sevron Blues in conjunction with a disperse yellow and pink. It has been found that in light shades the basic blues possess lightfastness superior to that of any disperse blue, but that selected disperse (acetate) reds and yellows are superior to the corresponding basic colors. Combinations dyed in this way can be expected to produce good washfastness at 140°F and 40-hour Fade-Ometer fastness.

For medium shades the neutral-dyeing premetalized dyestuffs are applied, and for heavy shades, usually acid-dyeing metalized dyestuffs or, if extremely high washfastness is required, chrome dyestuffs. Chrome dyestuffs selected for their ability to chrome over completely possess extremely high colorfastness properties at extremely low dyestuff cost. Chrome dyestuffs sensitive to sulfuric acid are applied at the outset from organic acid, but, when substantially exhausted, sulfuric acid is added in two additions to the extent of 4-6% to insure complete fiber penetration. The goods are chromed over in a second bath with 50% of chrome on weight of dyestuff at 205°F. After development is complete, which usually takes 1 hour, the goods are rinsed and finally scoured for 15 minutes at 120°F with a nonionic detergent. Not all chrome dyestuffs chrome readily on Acrilan, but there is a sufficiently wide range available to cover all suitable shades.

Although obviously the mechanical techniques are different, essentially the same principles of coloration are applied in the dyeing of raw-stock or yarn.

VAT LEUCO ESTERS———In package dyeing, for solubility reasons, basic, selected acid, metalized, and chrome dyestuffs are used for shades for which disperse dyestuffs are used in other forms of dyeing.

The soluble-vat, or leuco-ester, type of dyestuff, such as the Algosols and Indigosols, have extremely interesting possibilities on Acrilan, and, because of the fact that almost complete exhaustion can be obtained, are much less expensive to apply on Acrilan than on cellulosic fibers, while at the same time providing vat colorfastness. Acrilan automotive fabrics have been dyed with soluble vats to produce very high lightfastness.

The method of application of leuco esters on Acrilan fiber is closely similar to that on wool, and the dyeing is carried out initially at 160°F in the presence of Rongalite CX, followed by two additions of sulfuric acid and a raising of the temperature to 200°F. A retarding agent, such as Peregal ST, is recommended because of somewhat rapid exhaustion. Sulfuric acid is the means of obtaining full fiber penetration. A 60-minute dyeing period is sufficient to produce exhaustion for even medium shades. The dyeing mechanism is entirely different from that of soluble vats on cotton, and it is interesting to note that, under the above mentioned conditions of dyeing, the Acrilan in blends of Acrilan and cellulosic fibers is dyed and the cellulosic portion is left undyed. This fact suggests a method of vat-dyeing blends of Acrilan and cellulosics where high fastness properties are required. The oxidation of leuco esters on Acrilan is most efficiently accomplished with sodium bichromate and sulfuric acid at a temperature of 160-185°F for 30 minutes and is followed by a light neutralizing scour.

VAT DYES———A wide range of vat dyestuffs may be applied to Acrilan in the reduced state but at a lower pH than is the case with cotton. Many of the indigoid and thioindigoid dyestuffs may be dyed on Acrilan in package or rawstock form at the boil, but the anthraquinones require pressure and a temperature of 225°F to obtain optimum results. The vat dyestuff may be reduced in stock vat as is conventional, but sodium carbonate is the alkali used for the dyebath. It is desirable to buffer the dyebath to a pH of 10 by the use of sodium bicarbonate. Sodium formaldehydesulfoxylate is the preferred reducing agent. The General Dyestuff Company has carried out a considerable amount of valuable work in this particular field, and it becomes readily apparent that, wherever light and washfastness of a very high order is required, vat dyestuffs provide a conventional means.

DIRECT DYES———In view of the fact that many direct dyestuffs are closely similar in chemical composition to acid dyestuffs, it is not surprising to learn that

they may also be applied to Acrilan. Those direct dyestuffs that tolerate low amounts of mineral acid well dye Acrilan readily. Many direct dyestuffs build up into extremely heavy shades, and work is currently in progress to determine to what extent commercial recommendations can be made.

In summation, therefore, of the dyeing of 100% Acrilan, the application of direct, basic, acetate, neutral-dyeing premetalized, acid-dyeing premetalized, chrome, and vat dyestuffs has been discussed. It is to be seen that the dyer has a wide range of options at his disposal, and may make his choice dependent upon the needs of colorfastness costs, and types of equipment.

Because of the great flexibility possible in the dyeing of Acrilan, a method closely similar to one suitable for the second fiber in a blend may be selected when the first fiber is Acrilan. This has proved particularly true in dyeing Acrilan-wool blends.

## DYEING ACRILAN-WOOL BLENDS

Acrilan was designed to accept wool dyestuffs, but, when it is dyed competitively with wool, the wool, having a faster rate of dyeing, normally exhausts the dyebath before the Acrilan component has been more than only lightly stained. However, within this past year a simple process was developed and reduced to commercial practice whereby a full range of shades on Acrilan-wool blends can be obtained with the same dyestuffs for both fibers. The method was developed by the Chemstrand Corporation Research Department and is known under the name of the "Cation-Transfer System." The basic principle of the process centers around the fact that a number of cationic materials, in the presence of sulfuric acid and at the boil, will cause the transfer of a number of dyestuff types from the wool to the Acrilan and thus bring about a good union.

Metalized and chrome dyestuffs are normally employed for unions on Acrilan-wool blends in medium to dark shades. A number of neutral-dyeing acid types also give excellent unions as well as good colorfastness. It is interesting to note that ability to yield unions is a function of the individual dyestuff and that no one class of dyestuff can be said to be one hundred percent effective, although metalized and chrome dyestuffs most nearly approach this point. Originally it was found that, although many dyestuffs would transfer effectively from wool to Acrilan insofar as depth of color was concerned, there were tonal differences between the two fibers. However, as laboratory work progressed, color ranges were developed which gave excellent weight and tonal relationships between the two fibers. Furthermore, dyestuffs were found that, under conditions of transfer, would even dye Acrilan heavier than wool. The problem of accurate union dyeing therefore resolved itself into one of dyestuff selection, and, when this was accomplished, it was quickly found on a practical scale that the mechanics of the dyeing operation, based on this transfer system and a continual movement of dyestuff, produced an extremely good uniformity of color. Even in the very early phases of the development of union dyeing no problems of streakiness or unlevelness were encountered. An extremely interesting point to be noted in this operation is that the transfer does not seen to function exclusively through the water phase. It has been observed in the case of some dyestuffs that, though the wool may be fully dyed and the bath substantially exhausted, the transfer of the dyestuff to the Acrilan does not at any time result in an increased degree of dyebath coloration but seems to take place to a large extent directly from the wool to the Acrilan. Credence is given to this theory by the fact that, although the attached riders of 100% fiber may show considerable difference in shade, both fibers upon extraction in turn from the blend as well as the blend itself show an excellent union. For this reason the use of riders should be considered as indicative but not conclusive, and evaluation of the composite blend should be the primary consideration.

A range of men's wear shades from medium to black has been developed and is in current commercial use on a large scale. The choice as to whether metalized or chrome dyestuffs are used is entirely at the discretion of the dyer and the end use required. A general dyeing procedure for metalized dyestuffs is as follows: After the Acrilan-wool fabric or top has been prepared for dyeing, the dyebath is set with 3% of a nonionic agent such as Emulphor ON at a temperature of 100°F. The purpose of this material is to prevent the precipitation that can be expected upon the addition of cationic materials to anionic dyestuffs. The required metalized dyestuff is then added to the bath together with 3% formic acid owf. The recommended agent of a cationic nature, which may be Decomine (Arkansas Co), Peregal TW (General Dyestuff Company), Product G263 (Atlas Company), or Nahoctex A (National Oil Products), is then added to the dyebath and allowed to circulate. The temperature is raised to 200°F, then 3.5% sulfuric acid is added, and the goods are boiled for 30 minutes. An additional 3.5% sulfuric acid is added, and the goods are boiled for 90 minutes longer. In the early stages of the operation all the dyestuff is absorbed by the wool, but after the second addition of sulfuric acid a transferring action starts, which results in both fibers coming into close union. At the conclusion of the dyeing operation the goods are cooled and neutralized with sodium bicarbonate at 90°F.

Chrome dyestuffs follow essentially the same pattern insofar as dyestuff application is concerned, the keypoint lying in the initial use of organic acid in cases where sulfuric acid may cause precipitation.

Because of the deficiencies of light shades of the metalized and chrome dyestuffs in lightfastness, light to light-medium shades on Acrilan-wool blends have been dyed thus far with selected basic and disperse dyes for the Acrilan component in the same bath with the neutral-dyeing premetalized dyestuffs for the wool. A range of dyestuffs for the Acrilan has been developed possessing minimum staining properties, and the combined wool and Acrilan dyestuffs are applied from an ammonium acetate solution at the boil in the presence of an antiprecipitant such as Peregal TW. Dyeing periods of 2-3 hours are usually sufficient to dye shades from light to light-medium. The dyed goods are washed back at 120°F to remove staining from the wool. This technique can, in case of necessity, be used to correct the union of goods dyed with metalized or chrome dyestuffs and represents a simple insurance factor.

Very recent developments now indicate that many of the neutral-dyeing premetalized dyesuffs can be applied to Acrilan-wool blends to give good unions for those shades for which basic and disperse dyestuffs were used initially. A product under the name of Decomine, manufactured by the Arkansas Company, has the property, based on a pretreatment, of causing simultaneous dyeing of both fibers in the early stage from a weakly acid solution, followed in the later stages by small additions of sulfuric acid. The addition of any one of a number of nonionic materials is necessary to avoid dyestuff precipitation. As this new development is in its early phase, the latest findings will be given in a report soon.

Wool-dyed, Acrilan-white effects can be obtained on Acrilan-wool blends by a very simple method in spite of the ready dyeability of Acrilan with wool dyestuffs. A number of materials normally used as blocking agents on nylon can readily be used to occupy the available dyesites on Acrilan, and a pretreatment with such a material as Nylon Resist Salt GDC to the extent of 2-4% at 160°F in the presence of minimum amounts of acid. However, it is interesting to note that many of the metalized dyestuffs that union-dye Acrilan and wool may be employed in dyeing wool and resisting Acrilan.

Two-color effects on Acrilan-wool blends are readily obtainable by dyeing the Acrilan component with either disperse or basic dyestuffs or with combinations of both and dyeing the wool with neutral-dyeing premetalized dyestuffs. Peregal TW is used in the dyebath as an antiprecipitant, and the dyeing of both fibers may be carried out simultaneously. The dyed goods are lightly scoured to remove any stain.

## DYEING ACRILAN-RAYON BLENDS

Turning now to the question of dyeing Acrilan in blends with rayon, we find that a variety of methods is available, to some extent depending upon colorfastness and end-use requirements. The simplest approach is to dye both fibers simultaneously with disperse (acetate) and rayon dyestuffs. This can be done in shades from pastel to black by methods exactly as for rayon and acetate except that temperatures of 205°F or above are employed. The dyed goods are rinsed and lightly scoured to remove surface dyestuff. Aftertreatment with copper-resin complexes will yield washfastness of 140-160°F.

Basic dyestuffs may be employed in a one-bath two-step method using ammonium acetate and Peregal TW. The rayon is then filled in conventionally.

All types of wool dyestuffs may be similarly dyed in the presence of low concentrations of sulfuric acid. Tetrasodium pyrophosphate is then added to neutralize the bath, and a conventional dyeing of the rayon may follow.

Neutral-dyeing premetalized and rayon dyestuffs may be applied simultaneously in the presence of acetic acid to give good light and washfastness.

Where high washfastness properties are required, the Acrilan may be dyed with chrome dyestuffs as previously discussed, and the rayon may then be dyed in the conventional manner.

Acrilan-nylon fabrics may be union-dyed with selected metalized dyestuffs for medium to dark shades. In the early stages of the dyeing operation the nylon will absorb the major portion of the dyestuff, but prolonged boiling effects a transfer to the Acrilan, so that excellent unions of good men's-wear fastness can be obtained. Light and medium shades are dyed by combining selected basic dyestuffs, which dye Acrilan with only light staining of the nylon, in combination with neutral premetalized dyestuffs in the presence of an antiprecipitant.

Acrilan-Arnel blends can be dyed by employing selected dyestuffs for Arnel which also dye Acrilan to a very considerable extent. The difference in tone or depth can be resolved by the use of basic dyestuffs in the same bath which will dye Acrilan without effect on the Arnel.

The dyeing of an Acrilan-Dacron blend is governed by the need of Dacron for carrier assistance. Many dyestuffs employed on Dacron will also dye Acrilan, and here again the difference in tone or depth can be controlled with basic dyestuffs or with acid dyestuffs at the conclusion of the Dacron-dyeing operation.

## BLEACHING ACRILAN

Until recently it had seemed that the dyeing of Acrilan was largely limited in scope by our ability to obtain a good white. However, a recent development of an extremely simple nature resulted in the production of a good white for Acrilan sweaters. The bleaching agent finally used was acidified sodium chlorite, but all early attempts to obtain a white by its use alone were unsuccessful. It was discovered, however, that, after a pretreatment of the sweater goods with 2 g/l sulfuric acid for 20 minutes at 200°F, sodium chlorite would bleach Acrilan very effectively to give a very satisfactory white. The first work was of course carried out in the laboratory, and it was puzzling to find that the results in the field varied quite considerably from place to place. It was then found that the cause of the variable results was primarily the presence of iron freed from the stainless steel by the action of the acid chlorite. Normally used sequestrants were ineffective in controlling this condition, but it was subsequently discovered that, if phosphoric acid were used in the pretreatment along with the sulfuric acid and as a rinse immediately after bleaching, not only did the quality of the white become consistent but the white then became appreciably more stable to light. A further benefit was the reduction in effect of the acid chlorite on the equipment. After bleaching, the goods are simultaneously neutralized and antichlored.

The coverage of such a wide range of dyeing fields in the limited time of one evening must, of necessity, be at the expense of detail. Full detail is available, however, and it is hoped that another opportunity may arise whereby the general may be replaced by the specific. In the meantime I shall show you samples to illustrate some of the results discussed here tonight.

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**MEETING OF THE WESTERN NEW ENGLAND SECTION**

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**NOVEMBER 4, 1955**

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**HOTEL BOND, HARTFORD, CONN**

*Western New England Section——*

# SOME OBSERVATIONS ON THE CONTINUOUS DYEING OF COTTON PIECE GOODS WITH PARTICULAR REFERENCE TO VAT AND SOLUBLE VAT DYES*

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Causes and corrective measures are given for faults arising in the continuous application of vat dyes to cotton piece goods. Particular emphasis is placed on dye - specking and chemical - pad - control problems. The application of soluble vat dyes by continuous methods is briefly touched upon.

## INTRODUCTION

ALTHOUGH the continuous application of dyes to cotton piece goods is now *standard* practice, it would be erroneous to state that any bulk-scale dyeing procedure is a *standard* procedure. Specific local conditions dictate the precise nature of the various stages constituting the complete process. It is natural that, during the last 15 years of active development which has gone on in this field of continuous dyeing, there has accumulated a storehouse full of problems. Solutions to many of these have been found and a number remain unsolved. The poor dyer is never likely to be completely free from everyday problems but through exchange of views and interchange of information, through such organizations as the AATCC, it is possible perhaps to make his task a little lighter. A part of the pain disappears when one can discuss one's worries.

This paper will be confined almost entirely to the application of vat and soluble vat dyes to cotton, but it is possible that the observations recorded here may have some bearing on other classes of dyes, such as sulfur, naphthol and direct dyes, and to other fibers, such as the cellulosic rayons.

The many variants of the *impregnation → fixation* sequence, which is the essential of all continuous vat-dyeing processes, have been narrowed down to only three important ones, viz, pad-steam, pad-Williams Unit, and Standfast Molten Metal. The latter process, though widely used in Great Britain, has not, for obscure reasons become generally adopted in the United States. For versatility of the range of equipment, the pad-steam system, comprising a padder, a flue dryer, a padder, a steamer and an open-width finishing range, is by far the most important process lending itself to the application of vat, soluble vat, naphthol, sulfur and direct dyes.

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## VAT DYES

The vat dyes are applied by one or other of the following routes:

#1 Pigment Pad → Dry → Chemical Pad → Steam
#2 Pigment Pad → (Wet) → Chemical Pad → Steam
#3 Reduced Pad → Steam
#4 Acid Leuco Pad → Dry → Chemical Pad → Steam
#5 Acid Leuco Pad → (Wet) Chemical → Pad Steam

#1 is by far the most important and most widely used. #2 is generally restricted to pale-medium shades on low count, simply constructed goods, and is more difficult to control than #1. The reduced pad → steam, process #3, is rarely used except where surface dyeing and poor general quality can be tolerated; it is also a difficult process to control. #4 and #5 find some use in pale shades on fabrics which are difficult to penetrate and encroach to some extent on the fields normally left to soluble vat dye productions.

In the case of the pigment processes, #1 and #2, a common defect is that of the finished goods showing dye specks. Naturally, a prerequisite in obtaining speck-free padded goods is a dye dispersion free from large particles which will filter out on the surface of the goods being padded. All dyestuffs manufacturers endeavor to market their vat dye pastes and dispersible powders in a form which will give speck-free paddings. They are, in general, very successful in this connection, but it must be realized that the dye user is also in control of a number of factors which control the aggregation of padding liquors and other causes of dye specking. It is true that certain dyes have gained notoriety as potential "speckers" and the difficulty of producing satisfactory dye manufacture has been recognized by the makers and every effort is made to avoid dyehouse problems.

Speckiness in pigment padded goods is only rarely traceable back to the fault of the dye manufacturer. For instance, although a very good dispersion has been prepared by the dyer, it may still give rise to specks during processing. Such problems generally arise out of aggregated pigment particles in the color suspension or on the goods.

Before dealing with the common causes of these defects, it should be borne in mind that incorrectly stored vat dyestuff pastes can lead to serious specking problems due to a) freezing, b) drying out at the air/liquid interface in the package, and c) introduction of extraneous matter by way of paddles or breakage of drum liners.

The common causes of specking arising in the dyehouse may be dealt with under five major headings.

1) THERMAL EFFECTS: ABNORMAL ELEVATION OF TEMPERATURE—— It is frequently found that dyers tend to use high padding temperatures, eg, 175°-200°F, in the frequently false belief that they will obtain superior penetration. Temperatures of this order have a more or less marked influence on aggregation of pigment particles. The safest padding temperatures range from 110-140°F, with a good sound average of 120°F.

Elevation of temperature may be delib-

erate or fortuitous. In the latter case, leaking closed coils or open steam coils or badly constructed heating jackets in the storage vessel or in the padding trough can lead to localized aggregation or even evaporation and deposition of solid dye at the liquid/air interfaces.

2) TIME EFFECTS: DURATION OF STORAGE——The longer the duration of storage of pigment padding liquors, the greater is the tendency for aggregation to occur. Storage times should always be kept to a minimum and accurate calculations should be made to ensure that excesses of padding liquors are not prepared for carrying over to the next day or a later shift. It is not possible to lay down hard and fast rules on dispersion storage life because this is influenced tremendously by local conditions. With a running speed of 100 yards per minute, a storage time of 2½ hours would enable the production of 15,000 yards padded goods. Two and one-half hours should be looked upon as the absolute maximum storage life, unless previous trials have indicated a shorter or longer life for the dispersion concerned.

3) AGITATION EFFECTS —— Although this may be considered to be relatively minor in technical importance, it is known that very vigorous agitation can increase the possibility of dispersion collapse. This can be caused by large high-speed agitators in the storage vessels. It is necessary only for agitators to rotate gently in order to prevent the tendency of mechanical separation of the dispersion. Occasionally it has been suspected that the agitation of the padding liquor by mere passage of the cloth through the trough has caused dispersion collapse, but where this occurs, it is usually activated by supplementary means.

4) SURFACE-ACTIVE AGENTS: PADDING ASSISTANTS —— Certain types of padding assistants encourage the formation of dye aggregates and this type of effect is always aggravated by high temperatures and long storage times. A complete classification of padding assistants for this purpose has never been made and it is quite certain that a padding assistant which behaves perfectly with an Ahcovat dye will not be necessarily as good with a competitive vat dyestuff. In general, however, those wetting agents based on sulfonated oils, alkyl esters of fatty acid sulfates and sulfated fatty alcohols will encourage aggregation of a number of dyes under high temperature conditions. Providing that the padding temperatures are kept to a maximum of 120°F, and storage times at this temperature do not exceed about 2½ hours, little trouble is anticipated. Calsolene Oil HSA is an ideal padding assistant under such conditions and can be freely recommended. With temperatures of 140-200°F, it is safer to omit the use of a wetting agent altogether, or at least to avoid fatty-base types of agent. Alkyl naphthalene sulfonates usually are fairly safe agents, even at the higher temperatures, but these frequently give rise to serious foaming problems, which in themselves can give rise to specking by flotation of aggregates. Nonionic assistants, besides giving rise to aggregation troubles at specific temperatures due to cloud-point effects, usually lead to lower color yields on account of their powerful restraining tendencies. Cationic agents are to be avoided at all costs, since they form complexes with the anionic dispersing agents present in the dyes.

Persistent aggregation effects are sometimes overcome by preparing the goods with anionic rewetting agents. In this event it is essential to employ very-short-volume padding troughs so as to obtain a rapid turnover of fresh padding liquor and avoid build-up of dangerous agents bleeding from the goods to the padding trough. In this case, too, it is necessary to prepare the dye dispersion by addition of water alone.

5) ELECTROLYTE AND FOREIGN MATTER EFFECTS —— Occasionally the dyer endeavors to overcome migration problems in drying pigment-padded goods by making additions of electrolytes, such as sodium chloride, sodium sulfate or sodium bisulfite, to the padding liquor. Judiciously handled, such agencies can be made to give useful assistance, but they can also cause surface dyeing and severe aggregation if used in excess, and rarely is the establishment of a satisfactory compromise reliably achieved. Added salts will always cause flocculation of dye particles. Flocculates form nuclei for denser aggregates, which subsequently give rise to visible surface specking. A frequent cause of migration in drying is the employment of vat dyes which are overmilled to a super-disperse state. Such ultrafine particles are not always desirable for piece dyeing and can meander to the source of heat during drying and yield irregular back and face and/or side-to-center effects. Migration is best avoided by regulation of pick-up, drying speeds and temperatures, and under certain circumstances by searching for an alternate dye supply.

Frequently, the dyer reverts to the use of thickeners in the form of tragacanth, alginates, cellulose ethers, etc, in order to achieve higher pickup or to overcome differential fiber or yarn pickup. Such thickeners must be as perfectly dissolved as their colloidal properties will allow and they must be strained free from mucilage strings, lumps and residual fibers before use. They should be avoided wherever possible, since in almost all instances there is strong evidence of gum-dye affinity which is the prelude to specking. This is also the experience of our friends, the printers *(1)*.

Finally, the presence of loose lint, foreign matter carried into the padding trough by way of the cloth or service lines, may often act as a nucleus for the formation of pigment specks. All liquors fed to the trough should be effectively filtered, either by a sleeve on the perforated delivery pipe or by means of a filter set up between the storage vessels and the trough itself.

The cloth should be uniformly clean and possess no local pockets of electrolyte due to inefficient rinsing or neutralization. It is the author's contention that goods with a neutral or very slightly acid pH give rise to the greatest freedom of padding problems.

As a general rule, speckiness is more frequently encountered in pad-steam work, ie, where a short reduction time is employed and no leveling action as opposed to pad-jig work or Williams Unit reduction is allowed to take place. Naturally, the more soluble and rapid diffusing vat dyes have some opportunity to level from dye specks when sufficiently lengthy reduction times can be employed.

Another cause of speckiness which has a somewhat different appearance to the types hitherto described can be caused at the chemical padding stage by feeding dry hydrosulfite. This tends to form hard aggregates of undissolved and partially decomposed hydrosulfite which are picked up by the cloth and impressed into the goods by the nip of the padder. For this reason the author prefers combined solution feeds of caustic soda and sodium hydrosulfite.

The principle of cold chemical padding prior to steaming is still the most satisfactory system of operating the pad-steam process. In the author's experience, those dyehouses who have ventured to hot chemical padding, ie, using a large-volume padder or Williams Unit placed in front of the steamer, find greater difficulty in establishing consistent formulas which can be relied upon throughout the length of a run. Some surface leveling may be achieved on certain cloth constructions, but a steamer placed behind a hot running Williams Unit achieves no more than a second Williams Unit with the attendant shade control worries arising from running out of equilibrium and dye decomposition due to long running at high temperatures.

The following observations on hydrosulfite decomposition are of general prac-

tical interest. When solutions of caustic soda and sodium hydrosulfite are exposed to air, they readily absorb oxygen with the formation of hydrosulfite decomposition products such as sodium sulfite and sodium bisulfite thus:

(i) $O_2+2Na_2S_2O_4+2H_2O\rightarrow 4NaHSO_3$

(ii) $4NaHSO_3+4NaOH\rightarrow 4Na_2SO_3+H_2O$

Oxidation of this type results in the destruction of both hydrosulfite and caustic soda, since the latter is neutralized by the acid byproducts resulting from the oxidation of the hydrosulfite. It is not surprising, therefore, that there is quite an appreciable degradation of these chemicals in the storage vessels used for the purpose of maintaining a constant level by feeding to the padding troughs. The decomposition of such feed liquors is influenced both by temperature and by the access of air to the surface of the liquor; thus storage temperatures and surface areas of the storage tanks have a direct bearing on the stability of chemical padding liquors. Due to the high density of the salts of decomposition, there is a constant supply of fresh hydrosulfite rising to the surface of the liquor until decomposition of the stock is complete.

A 1:1 $NaOH:Na_2S_2O_4$ ratio is normally employed in pad-steam work. Using this ratio, we prepared the data in Table I by titration at various temperatures and times.

From studies such as these, coupled with plant experience, we have confirmed three simple factors, viz

i) To maintain as low a temperature as possible by use of ice where necessary, or alternatively, by circulation of cold water through jackets or coils in the storage vessels. If appreciably higher *padding* temperatures are required for any specific reason, the low temperature liquor should be fed to the padding trough by way of a temperature controlled tubular-type preheater.

ii) To prepare a minimum of caustic/hydro liquor for the completion of a specific run.

iii) To employ relatively small diameter storage tanks fitted with close-fitting alkali-resistant surface floats to minimize air exposure of chemical padding liquors.

Because so much emphasis is being laid on the pigment-padding and chemical-padding stages of the process, it must not be thought that precautions are not required at other stages. They are, of course, required at all the stages of processing, including preparing, drying, steaming, oxidizing and aftersoaping; the design of padders and other equipment is also important but the shortness of this paper will not allow discussion of these subjects here.

In order not to limit any value which this paper may have to vat dyers alone, we shall conclude with some brief observations on the continuous application of soluble vat dyes.

TABLE I

| *Hydro Starting Concentration (g/l)* | *Temp (°F)* | *Concentration after (minutes)* | | | | |
|---|---|---|---|---|---|---|
| | | *10* | *30* | *75* | *120* | *240* |
| 36.0 | 70 | 35.8 | 34.6 | 33.2 | 31.3 | 26.4 |
| 35.4 | 105 | 34.2 | 32.0 | 28.0 | 24.0 | 17.2 |
| 36.2 | 140 | 30.6 | 26.8 | 19.6 | 15.0 | 6.2 |
| 38.6 | 175 | 30.0 | 22.4 | 11.2 | 4.8 | 0.0 |

## SOLUBLE VAT DYES

The superb quality of pastel and pale-shade dyeings produced by this class of coloring matter by either discontinuous or continuous processing methods warrants a far wider adoption of the soluble vat dyes than they enjoy at present. They yield excellent levelness, penetration and a clarity and smoothness of appearance which is difficult to achieve by any other method of dyeing, with the possible exception of a few vat-acid or acid-leuco dyed shades which are more complicated to apply. The relatively simple sequence of pad color → acid develop → neutralize → soap can be adapted to most of the dye ranges designed for continuous dyeing and, in particular, perhaps to the pad-steam ranges.

The total range of dyes suitable for continuous dyeing which is available in this field is limited to approximately twenty-five and the average call in any given plant rarely exceeds about eight products whose individual characteristics are readily understood and appreciated by the average dyer. From a short range of products he can produce almost any pastel mode shade called for, with the exception of a true turquoise. A basic range of

1) Vat Soluble Golden Yellow IRK
2) Vat Soluble Brill Orange IRK
3) Vat Soluble Red IFBB
4) Vat Soluble Blue IBC
5) Vat Soluble Green IB
6) Vat Soluble Olive Green IBL
7) Vat Soluble Brown IR
8) Vat Soluble Brown IBR
9) Vat Soluble Olive IT
10) Vat Soluble Grey IBL

enables the production of almost any hue in demand. The substantivity or affinity for cellulose of these dyes varies somewhat and ideally it is necessary to choose dyes of similar characteristics for easiest shade control. For example, #2, 3, 4 and 7 have lower substantivities than #1, 6, 8, 9 and 10, and appreciably lower substantivities than #5. By the use of low volume padding troughs, where a rapid turnover of fresh dye liquor is demanded, it is possible to practically eliminate differential take-up effects. Where appreciable substantivity differences exist, the replacement of the normal 0.07-0.10 oz soda ash per gal by 0.03-0.05 oz caustic soda per gal has been found useful. Formulas require adjustment to suit local conditions for sodium nitrite content, acid concentrations and temperatures for developing, skying or air passage duration and aftertreatment conditions, in order to produce satisfactorily reproducible results. This is particularly important for avoidance of over-developed shades which can arise with dyes #3, 4, 6, and to a slight extent 10, under excesses of nitrous acid. The need for nitrous buffers such as thiourea may be called for where plant conditions cannot be otherwise modified. Other causes of shade variations along the length of a run are irregular neutralization and inefficient or insufficient soaping treatments. There are, for instance, some differences in soaping rates between the various dyes and these can only be eliminated by very efficient soaping treatments. A duplication of soaping boxes (preferably hooded) and maintenance of the efficiency of the alkaline detergents used, generally eliminate the problems arising at this end of the range.

## REFERENCE

(1) Rhode Island Section, AATCC, "Factors Which Cause or Prevent Agglomeration of Pigment Particles", *Am Dyestuff Reptr* 35, P3 (1946).

Back numbers of American Dyestuff Reporter less than two years old may be obtained from Howes Publishing Co, Inc, 44 East 23rd St, New York 10, N Y at the following prices: 50¢ each; $7.50 for a complete volume.

Earlier numbers may be obtained from the Secretary, American Association of Textile Chemists and Colorists, P O Box 28, Lowell, Mass. Prices postpaid: 50¢ each to nonmembers of AATCC, 35¢ to members; complete volumes $5.25 to nonmembers, $4.50 to members.

# ABSTRACTS

## A New Understanding of the Dyeing of Polyacrylonitrile Fibers

Dorset, B C M, *Textile Mfr* 81, 326-9, June, 1955.

The author states that fibers made from polyacrylonitrile have little affinity for dyes, due to the absence of suitable "atomic groups" (eg, CO-NH) attached to them which can attract ordinary dyes. The nitrile (CN) groups in polyacrylonitrile, which are highly reactive in other organic compounds, are much less active in the acrylic fiber molecule.

To overcome this trouble, the fiber has to be modified. Two methods have been employed:

1) The "cuprous ion" process, in which the fiber is treated with copper sulfate and a suitable reducing agent (eg, hydroxylamine sulfate), enables it to be dyed with direct and acid dyes. This process, which is in general use at present, and the chemistry involved, are discussed at some length by the author. Other metals besides copper may also be applied (eg, zirconium and silver), but so far copper salts have proved most useful.

2) A suitable basic substance (eg, a vinyl pyridine) can be added to the acrylonitrile in small quantities as a copolymer, to increase its affinity for dyes. A combination of about 94% of acrylonitrile and 6% of 2-vinyl pyridine has been found to have quite useful dyeing properties with selected cotton and wool dyes. The chemistry of this class of compounds is described.—WHC

## Some Controversial Aspects of Crease Resistance on Cellulosic Fabrics

Nuessle, A C Fineman, M N, and Heiges, E O J, *Textile Research J* 25, 24-40, January, 1955.

More than a quarter century has elapsed since the discovery that cellulosic fibers could be made more crease-resistant by means of synthetic resins polymerized within the fibers. This discovery (one of the most important in textile history) was of necessity made on an empirical basis, for as was pointed out by Marsh, one of the original inventors, "neither the structure of textile fibers nor of synthetic resins was clear at the time of the crease-resisting invention."

Since that time much has been learned about synthetic resins, textile fibers, and their combination in the creaseproofing process; yet many questions remain unanswered. This paper discusses some of the aspects of the subject that are still controversial: a) Differences between cotton and rayon and the reasons therefor. Factors considered include tensile strength, tear strength, abrasion resistance, permeability of the fibers, resistance to acid hydrolysis. b) A brief commentary on attempts to make cotton more like rayon. c) The mechanism of crease recovery, with emphasis on the question of covalent crosslinking vs resin formation. d) Other aspects of crease resistance, emphasizing subjective characteristics such as fabric hand.

The discussion throughout is more expositional than argumentative; ie, the problems are explained, with no attempt to resolve them. A few conjectures are made where feasible.

The paper closes with 33 references to the literature.—WHC

## Special Elastic Properties of Cotton Yarn and Cloth Mercerized without Tension

Goldthwait, C F and Murphy, A L, *Textile Research J* 25, 47-57, January, 1955.

The possibility of employing mercerization without tension, ie, slack mercerizing, to change the elastic properties of cotton yarns and fabrics, and to bring out other unusual properties in cotton, has aroused interest for many years. Slack mercerizing was first described by John Mercer in 1844, but relatively little application of this principle has been made to products for various end uses that have been proposed. Hence the possible wider utilization of the changed properties of cotton in various forms, imparted by slack mercerizing, has been of interest at the Southern Regional Research Laboratory ever since the beginning of its work on the chemical treatment of cotton.

Suitable cotton yarn or cloth mercerized without tension shrinks and its elastic properties are changed. Either yarn or fabric in its "shrunk" form shows greater than normal elongation, approximately in accordance with the amount of shrinkage that it has undergone. Either, also, tends to have increased elasticity. This feature is especially notable at low loads in open-weave fabrics, which usually have considerable stretchability after shrinking. Such elasticity is illustrated by a semielastic and conforming cotton gauze bandage which is in successful commercial production. This type of shrunk material, in heavier goods, appears adaptable to other uses, such as base fabrics for coating when elasticity is a required property of the coated fabric.

Thirteen references to the literature are cited.—WHC

## Flame-Resistant Cotton Fabrics: An Emulsion Treatment Using an Organic Phosphorus-Bromine Polymer

Frick, J G, Weaver, J W, and Reid, J D, *Textile Research J* 25, 100-105, January, 1955.

Flame-resistant fabrics are defined as those fabrics which will not support a flame. Considerable interest in such textiles has arisen because the fire hazards involved in modern life could be greatly reduced by suitably resistant fabrics. In military use, in particular, incendiary damage may be minimized by the use of flame-resisting tentage, tarpaulins, and clothing.

A summary of treatments for rendering cotton fabrics flame-resistant may be found in a monograph on the subject by Little. Few methods, however, are listed in which the flame resistance is retained when the fabric is subjected to repeated laundering, and those that are listed suffer defects of various sorts. Recently the use of brominated organic phosphate polymers has been patented with the claim that they give permanent flame resistance when applied to cotton fabrics. These products have been found to be effective, but for good results must be prepared by a laborious stepwise method and applied from organic solvent.

Flame-resistant cotton fabrics have been prepared at the Southern Regional Research Laboratory by treatment of the fabrics with an aqueous emulsion of an organic polymer, prepared from bromoform and triallyl phosphate. The finish is durable to repeated laundering, and when applied with proper plasticization to fabrics of 8-9-oz weight, does not materially change other textile properties. The treatment, which is described in detail, may be applied on conventional textile finishing equipment.—WHC

## Problems in Dyeing Synthetic Fiber Blends

Szlosberg, E, *Textile J Australia* 30, 340-3, 349-50, May, 1955.

After a brief explanation of the different types of wholly synthetic and regenerated fibers, the author explains the two more important methods of dyeing the wholly synthetic fibers at or near the boil, namely, by the use of carriers, or swelling agents, such as various cyclic derivatives, and by the use of cuprous ions from the reduction of cupric sulfate with hydroxyl ammonium sulfate. Acrilan and nylon fortunately have better affinity than the other synthetics, he says, and can be more easily dyed by conventional procedures.

Most of the paper deals with the use of these dyeing methods, or modifications and combinations of them, in one-bath and two-bath procedures to dye various fiber blends in solid shades. The production of two-tone effects is also mentioned.

The author reminds us that since the beginning of the year the Chemstrand Corporation has been producing a newer, improved type of Acrilan under a provisional code name CN 33. This type of Acrilan is more dyeable than its predecessor. Full shades, including navy and black, can be obtained on CN 33 with amounts of dyestuff only slightly higher than those used for natural fibers, and with quantities of sulfuric acid equal to those of dye (eg, premetalized acid dye).

It has been known for some time that basic colors have a direct affinity for Orlon fiber, and can be applied to it without the use of any such assistants as are necessary for the application of acid colors. Basic colors, however, when applied to Orlon 41 in the presence of wool, will stain the latter rather heavily; in some cases the shade on the wool being equal to that on Orlon, or deeper. When basic colors, however, are applied with acetic acid and a nonionic dispersing agent, the stain on the wool becomes very slight and can be soaped off after dyeing. The wetfastness properties of basic colors on Orlon 41 are good to excellent, while the lightfastness varies with individual members.—WHC

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## Some Practical Aspects of High-Temperature Dyeing

Rogers, W F, *Textile J Australia* 29, 1400-4, January, 1955.

The process of dyeing textile fibers at temperatures above 212°F, the normal boiling point of water, has aroused considerable interest since its inception a relatively few years ago. Originally developed for the dyeing of the newer synthetic fibers, its use has since been extended to include the older fibers, cotton and wool.

The reasons for the popularity of the new process are threefold, namely:

1) The possibility of obtaining fast shades on the new synthetics.

2) Reduction of processing time.

3) More level dyeing.

All the better known fibers with the exception of acetate can be dyed at temperatures above the normal boiling point, subject to various precautions regarding time, temperature, and bath conditions which are dependent on the particular fiber.

The use of high temperatures has been found essential to obtain fast, heavy shades on Terylene, and in practice a temperature of 250°F, corresponding to a pressure of 15 psi, is employed. The dyes used are those of the disperse (acetate) type and must be stable to the high temperature.

Orlon may be dyed at high temperatures (up to 250°F) either with the disperse dyes or with acid dyes using the cuprous ion method. It is necessary to choose acid dyes that meet the following requirements:

1) Dye at a relatively slow rate.

2) Will not precipitate under dyebath conditions.

3) Will not break down under these conditions.

The dyeing of Dynel and Acrilan is similar to that of Orlon.

The methods of dyeing nylon are already well known, but the use of high temperatures results in better penetration, easier levelling, and reduced dyeing time. The usual classes of dyes used are disperse, direct, acid, premetallized, and afterchrome.

In applying high temperatures to cotton and rayon, the new factors are the possibility of fiber damage and the stability of the dyes used. The author states that no appreciable damage occurs at 230°F in a neutral or slightly alkaline bath, but serious damage does occur if a strongly alkaline bath is used. He believes that a wide range of suitable dyes is available.

All classes of dyes normally used for wool may be successfully applied at high temperatures. The advantages to be gained are easier levelling, reduced processing time, and complete exhaustion of the dyebath.—WHC

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## Cellulose Acetate and Water Repellency

Mann, R J, *J Soc Dyers Colourists* 71, 579-87, October, 1955.

Cellulose acetate, in its water-absorption properties, ranks between the older fibers (with the exception of silk) and the newer synthetics.

Tests to determine showerproofing efficiency are numerous, but fall into the following main groups:

1) Those depending on the time taken visibly to wet the surface of the material being tested (eg, Rille test, spray rating test).

2) Those in which penetration of the material is the index of efficiency (eg, hydrostatic head test, drop test).

3) Those depending on the amount of water absorbed by the fabric under standard test conditions (not commonly used for commercial testing).

4) Combinations of two or more of the above principles (eg, Bundesmann test).

These various test methods are described by the author in much detail, with comments as to their relative value. He presents tables showing the comparative water repellency of various acetate and cotton fabrics as assessed by the above tests. There is much variation in the results, and the spray test is criticized as being "too subjective and not sufficiently discriminating."

Regarding the various methods for producing water-repellency in textiles, many of them depend on the use of wax emulsions, often in conjunction with metallic salts. One of the earliest processes used insoluble soaps (eg, aluminum soap). More recently, zirconium salts have been recommended. Velan PF, a quaternary ammonium compound (Zelan in USA) is an effective water-repellent, and has the extra advantage of giving the fabric a soft hand.

The silicones have recently come into considerable prominence as water repellents. The author describes various experiments with three of these products, Drisil 104, 115, and 148, on cellulose acetate taffeta, and compares the results with those obtained with the older proofing methods, when subjected to the various tests after washing and drycleaning. The resistance of the silicone-treated fabrics is especially good.

The author states that satisfactory water-repellency is also obtained with the silicones on mixtures of acetate and rayon, and from present indications, on triacetate as well.—WHC

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## Alcian "X" Dyestuffs in Textile Printing

Clarke, W, *Can Textile J* 72, 57-62, October 7, 1955.

Alcian Blue 8G, the first of this series of dyes produced by ICI, was based on copper phthalocyanine, an insoluble pigment. By the introduction of solubilizing groups, which are described, it was converted into Alcian Blue 8GS and later 8GN, both soluble in water. Four other soluble Alcian dyes have now been added to the line: Yellow GX, Greens 2GX and 3BX, and Blue 8GX.

These "X" brands are applied in printing with the addition of a nonvolatile organic acid (usually lactic) and a suitable solvent (eg, Glydote BN). The prints are dried and steamed for at least 5 minutes. During these operations the dyes become insolubilized, producing a range of bright blues, greens, and yellows fast to light and washing.

The author gives full details of the preparation of the pastes and the printing, steaming, and subsequent operations. He tells how these dyes may be printed alongside vat dyes, Fast Salt colors on Naphthol AS prepare, Rapidogens and Indigosols.

The Alcian dyes are said to be particularly successful as print colors on cotton and linen, but are not recommended for rayon or other fibers. They have apparently not yet been used to any great extent in dyeing.—WHC

## Dyeing Yarn Composed of 65% Dacron and 35% Cotton

Anon, *Tech Bull (du Pont)* 11, 111-14, September, 1955.

A full shade range on blends of Dacron and cotton can be produced with recently developed yarn-dyeing procedures. The method has been successfully demonstrated on blended yarns of 65% Dacron and 35% cotton in a single-bath operation.

The yarn is first bleached with hydrogen peroxide, rinsed, and usually scoured with a synthetic detergent. Disperse dyes are applied to the Dacron fibers at 250°F with the addition of methyl lactate (to prevent decomposition of certain dyes at the high temperature). After 1½ hours the temperature of the dyebath is dropped to 200°F and the cotton is dyed by the addition of vat pigments and caustic soda, followed by hydrosulfite. The vat dye is then oxidized with sodium perborate. Full details of these operations are given.

Maroon and black shades are dyed in a somewhat different manner, since developed dyes are required for the Dacron. The developer is added to the bath first, followed by the disperse dye, and after dyeing is complete, the color is developed in a hot nitrous acid bath. The cotton is then dyed with vat dyes by the standard procedure.

A list of suitable disperse and vat dyes for this purpose is appended.

Yarn composed of Dacron and cotton can also be dyed by carrier methods at 208°F, but these are not as economical as high-temperature application, and in some cases do not produce comparable fastness properties. In carrier dyeing at 208°F a scour is necessary between application of the two types of dyes.—WHC

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## Heat-setting of Nylon Fabrics (Measurement)

Furvik, N B, Bernskiold, A and Gralen, N, *J Textile Inst* 46, T6 62-7, October, 1955.

One of the most important properties of nylon materials, and perhaps best-known, is that when subjected to treatment by heat and/or certain swelling agents they acquire dimensional stability and will retain their shape permanently. Nylon fabrics so treated have increased resistance to distortion and recover more quickly from creasing, and the formation of permanent creases during the wet processing of the material is hindered. The treatment is known as "setting," or "heat-setting"; the latter type of treatment involves the use of heat. This paper deals only with heat-setting. As a practical criterion, a fabric may be considered set if it will not shrink more than one percent when boiled in water for 30 minutes.

The authors describe a method of measuring the degree of setting in nylon fabrics based on measuring the creasing angle of the wet fabric after creasing in water. Cuttings of the heat-treated fabric are folded and immersed in water at 60°C with a few drops of a nonionic wetting agent, and a 1000-g weight is placed on them for 5 minutes. The creasing angle is then measured in the Monsanto wrinkle-recovery tester or an apparatus similar to the Shirley combined stiffness and creasing tester.

The effect of various setting treatments was measured by this method. The results obtained showed that the crease-resistance (degree of setting) increased with increased setting time and temperature. The authors point out, however, that too long setting times as well as too high setting temperatures must be avoided in order not to damage the cloth.

Dry heat-setting and steam-setting were compared, as well as the effect of setting time and temperature. After setting in saturated steam the crease resistance was better than after dry treatment. An equation describing the relationship between degree of setting and setting time was found. The relationship between degree of set, setting time, and temperature is also briefly discussed.—WHC

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## Dyeing and Finishing of Cellulose Acetate Yarns and Fabrics

Ellison, T, *Dyer* 114, 447-51, September 16, 1955.

Every fiber possesses its own fundamental characteristics, and cellulose acetate is no exception. Its most important properties from the standpoint of the dyer and finisher are:

1) Its thermoplasticity
2) Ease of luster modification
3) Danger of saponification
4) Unusual dyeing characteristics.

The first is an inherent property of the fiber, and certain simple precautions (eg, avoiding high temperatures) are necessary during dyeing and finishing if creasing and glazing are to be avoided. Delustering is purely a question of temperature control, and under normal conditions of dyeing the usual precautions are sufficient to avoid this fault. Saponification also does not occur under normal processing conditions. Carbonate alkalis in the quantities used in dyeing have insufficient effect to interfere with either dyeing or finishing. Caustic alkalis will, of course, readily induce hydrolysis, with consequent loss in cloth weight, modified hand, and altered dyeing characteristics.

Since cellulose acetate cannot be dyed with direct dyes, a new range of dyestuffs had to be built up; ie, the so-called "disperse" dyes. These are insoluble products chemically related to many of the wool colors but containing no solubilizing groups. They are applied in the form of dispersions at 80-85°C with the addition of suitable levelling agents, and now constitute an important group of dyes.

Vat dyestuffs of the indigoid class can be successfully applied to acetate from a caustic soda/hydrosulfite bath. Control of the amount of caustic soda is important if hydrolysis of the acetate is to be avoided, and a strict limitation is placed on the pH value of the dyebath, which should not be allowed to rise to more than 8.5. Dyeing is usually done at 80°C.

The range can be augmented by the use of azoic dyeings. Many of the naphthol end components are substantive to acetate, and it is therefore the usual practice to apply the base and the naphthol from one bath, followed by diazotization.

Details of the application of these various classes of dyes to acetate yarn and knitted and woven fabrics in the dyehouse are given by the author.

Acetate fabrics lend themselves to a variety of finishes, both applied and mechanical; eg, the moiré finish, for which the fiber is particularly suited because of its thermoplastic nature.

The author also discusses "gas fading," ie, the effect of atmospheric oxides of nitrogen on some dyes. He recommends the use of only dyes that are immune to attack.—WHC

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## A Soil-infection Method for the Testing of Textiles for Resistance to Microbiological Attack

Lloyd, A O, *J Textile Inst* 46, T6 53-61, October, 1955.

A testing technique is described in which physical conditions can be standardized to a greater degree than hitherto. After the presentation of the various factors involved in assessing the efficiency of rotproofing and moldproofing treatments and the discussion of difficulties that arise in testing, due mainly to the sensitivity of microorganisms to variations in environment, the new method is described in detail.

Strips of textile, partially coated with a soil-compost suspension, thickened to a paste with kieselguhr, are incubated while suspended over water. By the use of asbestos plugs of standard size and weight, holding a standard amount of water, moisture conditions within the strips are graduated from complete saturation to mere dampness. Mold-resistance and rot-resistance are determined simultaneously. Photographs are presented illustrating the technique and some of the results obtained.

The author suggests that these results are not intended to be taken as a strictly quantitative assay of the materials tested, but points out that they do, incidentally,

illustrate the fact that clean scoured and bleached cotton is much less susceptible to fungal attack than cloths, such as cotton duck in the grey state, which contain natural impurities or added sizing materials. However, in direct contact with the soil layer, he says, rotting proceeded at very nearly the same rate on pure and impure cloths.

Numerous references to the literature are cited.—WHC

## A Survey of European Crease-resist Finishes on Spun Viscose Rayon Fabrics

Best-Gordon, H W, Pieper, E, and Tattersfield, C P, *Man-made Textiles* 31, #372, 77-80; 32, #373, 68-72; #374, 58-63, May, June and July, 1955.

Some time ago the Dyeing and Finishing Subcommittee of the International Rayon and Synthetic Fibers Committee arranged a series of crease-resist finishing trials. The project was intended to cover the treatment of a fabric made from viscose rayon staple by submitting it to various finishes used in European countries, and subjecting the finished fabrics to long-term practical wearing trials and physical and chemical laboratory tests.

The fabric selected was a 2/2 twill. About 100 yards were sent to each selected finisher for dyeing to any shade, followed by their standard crease-resist finish. The dyeing and finishing were done by firms in eight countries. The finished fabrics were made into dresses, four from the material from each finisher, and were given to office workers in the areas of Manchester and Bradford, who were given definite instructions about wearing and washing the dresses. Each wearer filled out questionnaires recording her observations (eg, hand of fabric, crease behavior, soiling, skin irritation, etc). In addition, observations were made by independent experts.

The fabrics, before and after the wearing trials, were also tested for crease recovery, abrasion resistance, and shrinkage, and were analyzed for resin content. The results of these tests are presented in tables.

*Summary.* Evidence has been produced and collated on a considerable scale for a long-term practical assessment of fabric quality under user conditions. The evaluation of this series has proved a difficult task, particularly because the wearers of the dresses and the expert observers were not in complete agreement in their observations.

Of particular interest is the wide variety of methods used in the preparation of the applied resin. The analyses show that there is no consistency in the formaldehyde-nitrogen ratio employed by the various finishers. This would suggest that there is no readily detectable difference in wear between one ratio and another.—WHC

## The Fixation of Direct Cotton Dyes

Gill, R, *J Soc Dyers Colourists* 71, 380-8, July, 1955.

The fastness of direct cotton dyes to wet processing in general, and to washing in particular, is not good. A few dyes are improved by aftertreatment with formaldehyde; other selected dyes by coppering or chroming; and still others by diazotizing and developing.

However, a demand exists for products which are capable of application by a simple aftertreatment to the majority of direct dyes, and which, without affecting the hand of the fabric, will have the following properties:

1) They will give a substantial increase in the wet fastness of the direct dyeing.

2) They will not affect the color of the dyeing.

3) They will not decrease the lightfastness of the dyeing.

In the past 20 or 30 years a large number of products have been marketed which are readily applied and have no adverse effect on hand, but which, while meeting the above three conditions in varying degrees, have their limitations.

Products of this nature are grouped by the author as follows:

1) *Surface-active Cationic Materials.* These give excellent fastness to water, acid, and alkali, but little or no improvement in fastness to washing with soap. In many cases the lightfastness is much decreased and the shade altered.

2) *Nonsurface-active Quaternary Ammonium Compounds.* In effect these compounds are analogous to Group 1 but generally give somewhat improved fastness to washing, and in many cases have less effect on lightfastness and shade.

3) *Synthetic Resins* (various types). The fastness to alkali and water is somewhat below Group 1, but the fastness to washing may be quite good and the change in shade very slight. The decrease in lightfastness varies, but may be reduced in some cases by addition of a copper salt. The author states that this group has "virtually ousted the two earlier types of fixation".

All these groups are discussed in much detail, and examples are quoted to show the general structural requirements for fixation. A theory is presented to account for the fact that, besides increasing the fastness to wet processing, fixatives in general also may cause change in color and decreased lightfastness.

The conclusion is drawn that there is a definite limit to the increase in fastness to washing of direct dyes with soap or other anionic detergents which may be attained with cationic fixatives generally.—WHC

## The Principles and Practice of the Flameproofing of Textiles

Ward, F, *J Soc Dyers Colourists* 71, 569-78, October, 1955.

A *flameproof* fabric may be defined as one which does not propagate flame, although it may burn or char when subjected to any form of heat. A fabric may be flameproof and yet glow after removal of the source of heat. This effect is classified as *afterglow*. A fabric is termed *glowproof* when there is no afterglow or when it ceases to glow within a stated number of seconds.

On these definitions, the only untreated fibers which may be termed flameproof are alginates, glass, asbestos, Saran, and dynel, none of which has a wide field of use. Wool, casein, and other protein fibers, although inflammable, are not considered serious fire hazards, owing to their relatively high ignition point and comparatively slow flame propagation rate. The thermoplastic fibers are difficult to classify, as they melt and shrink away from the flame; but it is clear that nylon and Terylene are much less flammable than viscose rayon, acetate, cotton, linen, and Orlon, all of which burn readily. The practice of flameproofing textiles, therefore, generally concerns aftertreatment of this last group of fibers.

The author reviews the historical developments in flameproofing processes during the last 140 years, and refers to legislation in the US prohibiting trade in highly flammable fabrics.

He states that a practically useful flameproofing material for cellulose should not

1) tender the fabric, either during or after treatment,

2) crystallize on the surface of the fabric when subjected to varying humidities,

3) require an addition of more than 15-20% on the weight of the fabric,

4) spoil the hand of the fabric,

5) be poisonous or dermatologically harmful,

6) produce afterglow.

Treatments may be conveniently divided into those which are reasonably fast to water and those which are completely removed by washing.

Of the water-soluble treatments, the author mentions particularly mixtures of borax and boric acid, of borax and ammonium dihydrogen phosphate, of zinc chloride and zinc phosphate dissolved in ammonia, and of sodium tungstate, boric acid and ammonium dihydrogen phosphate. He also refers to ammonium sulfamate.

Permanent treatments for cellulose are based on several different principles:

1) Modification of the cellulose (eg, to cellulose phosphate or sulfate). The author describes the Bancroft and Courtaulds treatments and also the so-called "THPC" process of the Southern Regional Research Laboratory.

2) Precipitation of an oxide within the fiber (eg, by the "Perkin" method, employing sodium stannate and ammonium sulfate to produce stannic oxide. or by using Erifon (DuP), which is an acid solution of antimony and titanium oxychlorides).

3) Coating the fabric with a resin containing certain oxides (eg, antimony oxide).

The author briefly reviews various attempts to flameproof acetate (without much success), and the treatment of blends of cellulose with other fibers.

A new theory is suggested for the basic mechanism of the burning and flameproofing of fabrics. The methods of testing flammability and related properties, including the AATCC Flammability Tester, are critically described, and the difficulty of interpreting laboratory data in terms of actual fire hazard is shown. Some new data on the ignition temperatures and vertical burning rates of a series of fibers are given. The paper closes with 40 references to the literature.—WHC

## Some Observations on the Dyeing of Wool at High Temperatures

Coutie, G A, Lemin, D R and Sagar, H, *J Soc Dyers Colourists* 71, 433-43, August, 1955.

The dyeing of textile fibers at temperatures above 100°C is not new. In 1945 a process was patented in America for the continuous dyeing of piece goods above 100°C. A few years later Steverlynck developed the "static pressure" system for high-temperature dyeing. In the past few years, therefore, the use of high-temperature dyeing has passed from the experimental and development stages to commercial use, and machines for this purpose are now available from a wide range of manufacturers.

A considerable body of experimental data on the high-temperature dyeing of wool has been accumulated, and in some cases conflicting results have been reported. The object of the present work was to undertake a systematic examination of the dyeing of wool at temperatures above 100°C, and to determine its practical value. As far as possible, all experiments were carried out on a Pegg single-package high-temperature machine of commercial design which works on the Steverlynck "static pressure" system.

The experimental data included tests of the stability of a large number of wool dyes to dyeing at 115°C, and the effect of dyeing at 110° and 120°C on the wet fastness properties of dyed wool, on the levelling properties of wool dyes, and on the physical properties of wool yarn (strength, resistance to abrasion, etc). The data are tabulated.

The results of these experiments are summarized as follows:

It is shown that dyeing temperatures above 100°C can result in the decomposition of a number of wool dyes, primarily as a result of reduction. The full wet fastness properties of wool dyes can be obtained in short times at elevated temperatures. Quantitative tests indicate marked increases in the rate of redistribution of dye at elevated temperatures. Tests on the physical properties of worsted yarns show that excessive degradation of the wool fiber occurs at temperatures above the boil if strongly acid or, particularly, neutral dyebaths are employed. It is shown that wet tenacity is a much more sensitive criterion of fiber degradation than dry tenacity. Conditions of time, temperature, and pH are suggested which will yield satisfactory dyeings at elevated temperatures without producing undue fiber degradation.—WHC

## Colored Discharge Technique

Bertolina, G, Broggi, A, and Scarpella, A, *Dyer* 114, 775-9, November 11, 1955.

The commercial progress of printed cellulose acetate and acetate-viscose has undoubtedly been hindered by the technical and economical difficulties encountered in the production of colored discharge prints.

Concerning the dyeing of fabrics of these types, to be color-discharged, it is well known that many dyestuffs can be used which are perfectly dischargeable. Complications arise, however, when dyestuffs are to be introduced into the printing paste. Basic and vat dyes are the most frequently used for discharge printing, but the former lack fastness to light, and the latter cannot be printed on acetate by conventional methods.

The authors refer to a recently introduced color discharge method, the so-called "Manofast" process, in which thiourea dioxide is used as the reducing agent instead of zinc sulfoxylate-formaldehyde. This gives very good results with selected vat dyes on acetate fabrics, but is not completely satisfactory on acetate-viscose, according to the authors.

Quite recently a new color-discharge-printing technique has been developed which makes use of pigments. The Interchemical Corp has introduced a new clear (Aridye Clear 6150) to which zinc sulfoxylate-formaldehyde and selected pigment colors can be added. However, as is generally the case with pigment colors, the brightness is not very high and the hand of the fabric can be impaired.

The authors have now found that it is possible to obtain very good results in color discharge printing on acetate-viscose fabrics by using thiourea and selected direct and disperse dyes instead of vat dyes. They list a large number of disperse dyes that are suitable for printing the acetate (ie, that are not discharged by the thiourea dioxide), and a limited line of direct dyes for printing the viscose. Full details are given for carrying out this new process.

It appears that while thiourea and zinc sulfoxylateformaldehyde are equally good for discharging the grounds, only thiourea enables printing to be done with a complete range of direct and disperse dyes.

Nine references to the literature are cited.—WHC

## Electrostatic Flock-Finishing (Printing) of Textiles

Bird, V, *Can Textile J* 72, 51, November 18, 1955.

Flock printing is very popular at the present time, and many firms are now marketing cloths in which this treatment plays an important part. Even nets have been printed with a floral flock pattern recently.

In the past, before the introduction of electrostatic flock printing, the surface to be treated was given a coating of adhesive and the flock was then dusted onto this through a sieve. The flock was attached to the adhesive, but the final result, after surplus flock had been removed, was far from satisfactory, as the arrangement of the tiny lengths of fiber was quite random and no even pile was produced.

The principle of the electrostatic method involves the charging of the tiny flock particles with a high voltage while the surface to be flocked is grounded. The difference in potential between the flocks and the base material is used to propel the flocks into the previously glued surface. During the process, the electric force aligns the individual flocks, which enter the adhesive layer at right angles, and in that way they are attracted to the base material at one end of their short length.

A West German firm, Arno H Wirth, has developed an efficient electrostatic unit, the operation of which is described by the author. In this machine a collection device removes excess flock, which is taken back and used over again, so that there is no loose flock floating in the air. Radio frequency heating is said to be the most satisfactory method of drying the adhesive.—WHC

## Cotton Crushproofing: Theory, Chemistry, Application

Borghetty, H C and Fornelli, D, *Textile World* 105, 102-17, December, 1955.

This is the most complete exposition of the principles and practice of cotton wrinkleproofing that has yet appeared. It should be read in its entirety by all interested readers.

The subjects discussed by the authors include the following: a description of the fundamental principles on which crushproofing is based, as propounded by T B Lee Co and others; the structure of the cotton fiber and a comparison of cotton and rayon in their creaseproofing behavior; the chemistry of the different resins and other chemicals that are used for proofing, and their reaction with the cotton fiber; a comparison of various curing catalysts employed; the effect of the fabric construction on the success of the proofing operation; the effect of resin treatment on the fabric's abrasion resistance; the influence of softeners in improving tear strength; a full description of the application of the resins, including curing; the danger of chlorine retention; and special finishes obtainable by the use of resins (eg, glazing, embossing and plissé effects).

The report closes with 21 references to the literature.—WHC

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## Dyeing Vat Colors at High Temperatures with Sodium Sulfoxylate in Place of Sodium Hydrosulfite

Wood, P J (Presented at the 27th International Congress of Industrial Chemistry in Brussels in 1954).

For many years past there has been a lively interest in dyeing vat colors at temperatures higher than those heretofore considered normal. Sodium hydrosulfite has been the reducing agent most commonly employed. It is stable in caustic soda solution up to 200-210°F, and might be used in high-temperature vat dyeing except for the danger of over-reducing the dye and destroying the shade. Various methods that have been suggested for the prevention of this over-reduction are discussed by the author.

In 1949, R D Blum, Jr, investigated the possibility of using sodium sulfoxylate-formaldehyde as partial replacement of hydrosulfite in the dyeing of hosiery and hosiery yarn in package form. Dyeing was started at 195-200°F with the addition of caustic and sulfoxylate, and was completed by dropping the temperature to 160°F and adding hydrosulfite. Hosiery and yarn dyed by this method were said to be even and well penetrated.

The possibility was next explored of using sulfoxylate as the sole reducing agent. A paper on this subject was presented by the South-Central Section of the AATCC in 1953.

The Royce Vat Dyeing Process, which is claimed to be an improved method for dyeing Indanthrene Blues at high temperatures, and for which a patent has been sought, is discussed by the author. In dyeing hosiery by this method, the vat dye is dispersed with a suitable detergent and added gradually to the bath at 160°F. Caustic soda and sulfoxylate are added next in several portions during which time the temperature is raised gradually to 210°F and dyeing continued for 10 or 15 minutes. The goods are then washed and oxidized with perborate.

The author states that this process bids fair to overcome some of the difficulties met with in the conventional method, and that it may result in doing away with the necessity for dyeing at higher temperatures than 212°F with some fibers and with many dyes, with probable elimination of the use of retarding agents.—WHC

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## The Printing of Wool, including the Mélange or Vigoureux Printing of Other Staple Fibers

Potter, J A, *J Soc Dyers Colourists* 71, 645-52, November, 1955.

The author points out that printed styles can be produced by one of four methods:

1) Hand-block technique
2) Rotary block or surface printing machine
3) Machine or roller (intaglio) printing
4) Screen printing.

The application of each of these methods to wool is briefly described.

With wool, apart from normal preparation processes, such as scouring and, if necessary, bleaching, chlorination is always required in order to assist wetting and dye absorption.

All types of dyes used in wool dyeing can be used in wool printing. Direct and basic dyes and leuco vat esters also may be used.

Thickening agents such as British gum and gum tragacanth are employed. Other additions to the paste are wetting agents, acids, and products to assist fixation during steaming. The addition of urea is said to have a tendency to harshen the wool.

Moist steam is essential, and it is usual to steam at 100°C in a cylindrical chamber. Alternatively, a Mather & Platt continuous steamer or ager may be used. It is essential not to steam under pressure, in order to avoid yellowing and damaging the wool.

The author describes in much detail the Mélange or Vigoureux printing of slubbing and the preparation of typical printing pastes for wool, Terylene, viscose rayon and mixtures of wool and viscose.

For wool, dyes are generally selected from the following classes: Acid Alizarine, acid milling, chrome, and metal-complex dyes. British gum appears to be the chief thickening agent employed. An addition of sodium chlorate is made to the paste to improve the yield. Glycerin is added to prevent the paste from drying before steaming. Very humid steam at atmospheric pressure is employed, usually for one to two hours.—WHC

## The Use of Silicones in the Textile Industry

Watson, T W, *J Soc Dyers Colourists* 71, 641-4, November, 1955.

The generic term *silicones* was originally given to silicon compounds containing Si-O linkages; at present it is applied to organosilicon polymers, or more correctly, to organopolysiloxanes containing Si-O and Si-C linkages.

The properties associated with the linear dimethylpolysiloxanes, more commonly known as dimethyl silicone fluids, typify those of all the silicone products of interest to the textile industry. They include:

1) Flat viscosity-temperature curves
2) Outstanding oxidation resistance
3) Inertness to many chemicals
4) A high degree of water-repellency.

The last-named property is, of course, that best known in the textile industry. However, in order to develop to the full a permanently water-repellent surface, the dimethyl silicone fluids require a curing schedule of 2-3 hours at 250°C, which would not be permissible on textiles.

The author describes further research on this problem, leading finally to the development of a methyl polysiloxane which when dissolved in an organic solvent could be applied to textile fabrics, either diluted with more solvent or in the form of an emulsion, and could be cured in 5-10 minutes at 150°C. A suitable emulsion, having a storage life of a few months and compatible with a wide variety of finishing aids, is stated to be now available.

Thus, stiffening and antislip agents and crease-resisting resins may now be combined with the silicone emulsion, though the author states that careful control of the process is necessary if good results are to be obtained.

Silicone rubbers, too, have been developed for rendering textiles waterproof, but at present they suffer from two major disadvantages: poor adhesion compared with organic rubbers and plastics, and high price.

Silicones exhibit marked surface activity, and find extensive application as antifoaming materials (eg, in printing pastes).

A recent development of a silicone specifically designed to meet the needs of the textile industry is a solvent solution containing 25% of siloxane, which when applied to drying cans eliminates build-up of sizing material on the cans.

The author also refers to the use of silicone greases which, because of their ability to withstand heat and corrosion, are finding uses as lubricants (eg, for ball-bearings in drying cans, and for valves in chemical pipe-lines). Similarly, silicone resins and rubbers are being used as electrical insulants, particularly for motors.

The author believes that silicones will play an increasing part in the processing and finishing of textiles in years to come.

# News of the Trade

## • Koppers to Market PC&C Dyes

Koppers Company, Inc has arranged to take over the marketing of textile dyes which have been made and sold by Pittsburgh Coke & Chemical Company.

George M Walker, vice president and general manager of Koppers Chemical Division, has announced that, following decision of Pittsburgh Coke & Chemical to discontinue the direct marketing of dyes, the eight-member sales staff of that company, which has been assigned to sales of dyes, will join Koppers wholly-owned subsidiary, American Aniline Products, Inc, which has its plant at Lock Haven, Pa.

Under terms of the agreement, Koppers acquires the textile dye business of Pittsburgh Coke & Chemical, exclusive of its manufacturing facilities in that field.

Mr Walker said that Pittsburgh Coke & Chemical will continue to produce a number of vat dyes not currently made by American Aniline, but that all marketing of such dyes now will be handled by the Koppers subsidiary. Pittsburgh Coke plans to devote an increasing portion of its fine chemicals manufacturing equipment to the production of other fine organic chemicals.

"The arrangement with Pittsburgh Coke will broaden Koppers coverage of the textile industry," Mr Walker said. "Our American Aniline subsidiary already is a large producer of dyes for textiles including the synthetic fibers, such as acetate, Dacron, Orlon and others, as well as dyestuffs for the leather, paper, petroleum and plastics industries." The agreement became effective on December 31.

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## • Textile Division of Wiesner-Rapp Moves to New Location

The Wiesner-Rapp Co, Inc, Buffalo, N Y, has announced the moving of its Textile Division to a new location. The company, which operates five divisions, recently purchased a plant on Chicago Street in Buffalo, which has over 20,000 square feet of manufacturing space plus good office facilities.

The move will combine the Textile Division and the Job Shop Division, bringing sales, engineering and manufacturing under one roof. It is stated that this will result in better control and the added space will allow for a greater volume of business.

The Textile Division will continue to manufacture wet-finishing and dyeing machinery.

THE government of Iran, through the Technical Assistance Recruitment Services, Technical Assistance Administration, United Nations, is seeking an expert in finishing, printing and dyeing of silk to assume responsibility (other than administrative and financial responsibility) for the finishing, printing and dyeing department of one of the Government's Seven - Year - Plan - Organization textile plants for a period of one year. The expert should also train at least one Iranian engineer to take over his responsibilities at the end of the expert's assignment, as well as assure the training of a sufficient number of foremen to provide for the efficient and smooth operation of the plant during all shifts.

Knowledge of French or English is required, and knowledge of Persian would be a great advantage.

Interested parties should contact the UN's Technical Assistance Administration, New York 17, N Y, or the Foreign Economic Development Staff, U S Dept of Commerce, Bureau of Foreign Commerce, Washington 25, D C.

## • Butterworth Sold to Van Norman Industries

Van Norman Industries, Inc, Springfield, Mass, machine and tool company, has acquired H W Butterworth and Sons Co, Bethayres, Pa, through an exchange of stock. Completion of negotiations was announced jointly on Dec 27th by James Y Scott, president of Van Norman, and J Ebert Butterworth, president of the Butterworth firm.

Acquisition of the company involved exchange of 71,930 shares of Van Norman's newly created $2.28 preferred stock at the rate of 1.23 shares for each share of Butterworth common.

Founded 135 years ago, H W Butterworth & Sons Co's stock was owned by 58 stockholders, most of these being descendants of the founder, John Butterworth.

The Butterworth company is engaged in the design and production of washing, dyeing, bleaching, mercerizing and embossing machinery for the textile fabrics and spinning machinery for the synthetic fiber industry. Operations are conducted in a modern, one-story building of approximately 200,000 square feet, erected within the last five years at Bethayres in the Delaware Valley of Pennsylvania. Sales of the company for the first 11 months of 1955 amounted to $4,225,000.

Current assets of Butterworth, as of September 30, 1955, amounted to $2,016,412 with current liabilities $414,336 and capital and paid-in surplus $3,056,936. Van Norman has just paid its 80th consecutive dividend, and H W Butterworth & Sons Co has paid dividends in 45 of the last 49 years.

The entire management of the Butterworth company will be retained, and, in line with Van Norman policy, the company will be operated as an autonomous and separate company. In addition to its American operations, the company has sales agencies and franchised producers for some of its equipment in South America, Europe, Africa, the Middle and Far East.

Donald P Hess, chairman of Van Norman; Mr Scott, and Herbert I Segal, chairman of the executive committee of the parent company, will be added to the board of Butterworth. Mr Butterworth has joined the board of Van Norman Industries, Inc.

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H M Butterworth & Sons Company has announced its withdrawal from a three-way agreement announced in February, 1955, for the sales and servicing of textile finishing machinery made in Germany by A Monforts, Maschinenfabrik. Texplant Corporation, Stamford, Conn, machinery importers, is the third party to this agreement.

J Ebert Butterworth, president, explained that the Butterworth Company had planned originally to broaden their services to the textile industry through the sales of Monforts machines, including nappers, air drying equipment and cloth-room machinery. Since the agreement was made, an increased demand for Butterworth-built finishing machinery required so much time of the Butterworth sales engineers that it was impossible to do a constructive selling job on Monforts machines.

Inquiries regarding Monforts machinery are being referred to Texplant Corporation.

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## • New Locations for Two Rohm & Haas Offices

Removal of its San Francisco office to the new Pacific Mutual Building, 600 California Street, has been announced by Rohm & Haas Company, Philadelphia. The company's Pacific Coast manager, K L Jopke, will be in charge.

The company also has moved its Atlanta office to a new location at 1428 West Peachtree Street, NW. Customers for textile chemicals will be served from this office by A K Haynes and L C Harmon, Jr.

## • Solitone Affiliate Formed

Aaron Permut, consulting chemist and director of Solitone Laboratories, 263 Washington Pl, Hasbrouck Heights, N J, has announced the formation of its affiliate, Solitone Laboratories, SPRL, 128 Avenue Franklin Roosevelt, Brussels, Belgium.

The Belgian company will manage the licensing of Solitone colors for textile printing in Europe, Africa and the Middle East. It will also manufacture and distribute Solitone colors in the Benelux countries under the direction of H C Krygsman, who was formerly a director of Algemeene Amerikaansche Kleurstofonderneming (AAKO), Amersfoort, Holland, and is currently European distributor for the vat dyestuffs of Otto B May, Inc, Newark, N J.

Solitone's licensing of oil-in-water pigment printing colors for Latin America and the Far East is being conducted from its New Jersey office under the direction of Marte Previti. Mr Previti represented National Aniline Division for ten years in South America and has been connected with dyestuff manufacture, sales and export for almost 30 years. He is also president of Raritan Dyestuff Corporation.

## • New A-D-M Normal Fatty Alcohols

Archer-Daniels-Midland Co, Chemical Products Div, 2191 West 110th St, Cleveland 2, Ohio, has announced the commercial availability of five new normal fatty alcohols.

ADM Adol 13 consists principally of approximately 55% lauryl alcohol; ADM Adol 14, 65% lauryl alcohol; ADM Adol 15, 72% lauryl alcohol; ADM Adol 18, 90% myristyl alcohol; and ADM Adol 12, 90% lauryl alcohol.

## • Textile Institute Granted Supplemental Royal Charter

The Textile Institute, at a ceremony held last month in the Council Chamber of the University of Leeds (England), was granted a supplemental royal charter, extending the powers granted to it by its original charter of 1925.

The Supplemental Charter authorizes fellows and associates of the Institute (FTI's and ATI's) to practice and describe themselves as chartered textile technologists, a style and title which by royal prerogative becomes exclusively the right of professionally qualified members of the Institute.

New bylaws authorized by the supplemental charter provide that the Institute may elect companions (Comp TI). This is intended to be an honor conferred on members who, while not being chartered textile technologists, have yet advanced the general interests of the textile industry.

The Institute is also now authorized to grant the status of licentiate (Lic TI) to members who have attained the age of 23 and have obtained such certificate or diploma as the Institute may consider to provide sufficient evidence of education in textile subjects.

The Institute proposes by means of licentiateship to grant recognition to those who work in a particular field in or connected with textile but who do not have the opportunity or the desire for the broader knowledge required of candidates for the ATI and FTI, and thus to give encouragement to those whose work is devoted to the study of one particular fiber or process.

The new charter was received by the Institute's president, W T Winterbottom, from the Rt Hon the Lord Milner of Leeds, a member of the Privy Council.

## • Stein, Hall Holds Unique Sales Seminar

A firsthand view of what the customer expects from a supplier's salesmen was presented to branch managers and officials of Stein, Hall & Co, Inc in a unique seminar held by the Company at New York's Hotel Roosevelt on December 8th.

Purchasing agents representing customers in three of the fields served by Stein Hall were featured at a special session which was held in conjunction with the Company's week-long annual branch manager's meeting. Among those expressing views on effective selling methods in informal talks was Samuel A Belcher, M Lowenstein & Sons, Anderson, S C.

Mr Belcher opened the seminar with an interesting talk in which he first suggested a number of tips for good selling and then illustrated their application by means of a parable from the Bible. His advice included: 1) Observe the rules of the customer's company in your dealings with him, 2) Call on the prospect often enough to be known, 3) Know your business well — the better you know it the more convincing you'll be, 4) Be genuine, 5) Don't be afraid of the buyer — if you have something you think would be valuable to him don't let a gruff manner scare you away, 6) Ask for an order, and 7) If you fail to get the order, take it gracefully.

The parable which he used to illustrate the application of these rules concerned a sower who went forth to sow seed. Some of it fell by the wayside, some upon stoney ground, some among thornes and some on good ground. Mr Belcher then related the results to the effects of a salesman's efforts. Those efforts which are made in accordance with the rules of good selling he likened to seed that fell

**Members of the Cotton Utilization Panel confer with cotton scientists of the Southern Utilization Research Branch of the Agricultural Research Service, USDA. Seated (l to r) are: Leonard Smith, director of utilization research, National Cotton Council of America; C M Conrad, head, Cotton Fiber Section, SURB; John C Elting, director of research, Kendall Mills Research Laboratories; W J Martin, cotton utilization specialist, Federal Extension Service; Walter M Scott, assistant director of utilization research, ARS; R F Lederer, Technical Service Department, National Cotton Council; C H Fisher, chief of Southern Utilization Research Branch; R E Stevenson, research coordinator, ARS; and T G Hawley, director of research, United Merchants Laboratories. Standing (l to r) are: C F Goldthwait, head, Cotton Chemical Processing Section, SURB; H D Barker, head, Section of Cotton and Other Fiber Crops, Field Crops Research Branch; Richard Hall, agricultural economist, Agricultural Marketing Service; T H Hopper, head, Analytical, Physical-Chemical and Physics Section, SURB; E A Gastrock, head, Engineering and Development Section, SURB; Hugh M Brown, dean, School of Textiles, Clemson College; T L W Bailey, Foreign Agricultural Service; Mason DuPré, Jr, special assistant to the chief, SURB; George S Buck, Jr, technical service director, National Cotton Council; R J Cheatham, head, Cotton Mechanical Processing Section, SURB; and Lindsay Dexter, assistant treasurer, Pepperell Manufacturing Co. The group met at the Southern Laboratory in New Orleans, La, to study and evaluate various research projects that might be undertaken to improve cotton's economic position.**

on good ground and brought forth good fruit.

At the close of the talks, a lively discussion period took place with the purchasing agents answering a number of queries posed by Stein Hall's Branch Managers.

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## • Alexander Smith, Mohawk Consolidate Two Departments

Consolidation of two departments of Alexander Smith, Inc, with similar facilities at Mohawk Carpet Co in Amsterdam, N Y, and the resignation of A Griffin Ashcroft as vice president and director of research and development, have been announced by James M Elliott, president of Alexander Smith, Inc.

The consolidation will involve a transfer of the Research and Development Department, now located at Yonkers, N Y, and the Production Planning Department, located at 104 E 15th Street, New York, to the Mohawk Plant at Amsterdam.

The Sales, Advertising, Pricing and Styling Departments will remain in New York.

This is the first announcement of contemplated changes in the new organization, formed by the merger of Alexander Smith, Inc and Mohawk Carpet Co, which was approved today by the stockholders of both companies. The date of the transfer of these departments has not been set but will be consummated as quickly as possible.

Mr Ashcroft, who has been with Alexander Smith, Inc for twenty-three years, resigned his position effective December 31, 1955 following a decision to transfer his department to Amsterdam.

Edmund Leonard has been named acting director of the department.

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## • PTI to Dedicate New Residence Hall Feb 3

The Philadelphia Textile Institute, School House Lane and Henry Avenue, Philadelphia, will hold dedication exercises for its new $600,000 "Residence Hall" on Friday, February 3, at the Germantown Cricket Club.

Robert L Huffines, Jr, president of Amerotron, a graduate of PTI, and a member of the board of the Institute, will be the guest speaker for the occasion. Ceremonies to begin at 2:00 pm will include an academic convocation.

Following the exercises at the Cricket Club, the gathering will retire to the new building on the college campus for corner-stone laying ceremonies and the traditional ribbon cutting.

In conjunction with Dedication ceremonies, the PTI Alumni Association will hold its 55th Annual Mid-Winter Banquet at the Hotel Warwick, Philadelphia, at 7:00 p.m.

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## • Unishade

A new scouring and leveling agent combined for the one-bath system of dyeing nylon hosiery has been developed by Kali Manufacturing Co, 427 Moyer Street, Philadelphia 25, Pa.

Called Unishade because of the excellence of leg-welt unions, the agent prevents the welt from becoming lighter than the monofilament leg even under prolonged dyeing conditions, it is claimed. It is further claimed that uniform shades between the welt and leg and from one stocking to another are produced consistently.

Overdyed shades reportedly may be lightened uniformly by the addition of more Unishade to the dyebath. For more extreme action, a new dyebath using the original amount of Unishade will produce an appreciably lighter shade without disturbing the uniformity between welt and leg, it is stated.

Unishade is said to rinse out readily carrying suspended soils with it.

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## • National Blue 2BS Salt

National Aniline Div, Allied Chemical & Dye Corp, New York, N Y, has announced a new addition to its line of stabilized diazonium salts.

The new product, National Blue 2BS Salt, is designed to produce, on cotton or viscose rayon, a range of pleasing shades varying from greenish to reddish blue with the various National naphthols.

Most of these colors reportedly exhibit good fastness to light and hot pressing; very good fastness to washing; and excellent fastness to soda boil, acids, alkalis and rubbing. It is stated that this product may be applied on the continuous padding range, in pressure package dyeing machines, and in open tubs. It is said to be particularly adopted for printing, and to possess good shelf storage and excellent printing paste stability. Many of the combinations may also be discharged to very good white with hydrosulfite discharge paste. This product is suitable for use in the production of sport and work clothes, children's play clothes and materials that are to be rubberized.

# GENERAL CALENDAR OF COMING EVENTS

**AMERICAN SOCIETY FOR TESTING MATERIALS**

Feb 27-March 2—Committee Week, Hotel Statler, Buffalo, N Y; Mar 13-16—Spring Meeting of Committee D-13 on Textiles, Warwick Hotel, New York, N Y; June 17-22—59th Annual Meeting and 12th Apparatus Exhibit, Chalfonte-Haddon Hall, Atlantic City, N J; Sept 16-22—2nd Pacific Area National Meeting and Apparatus Exhibit, Hotel Statler, Los Angeles, Calif; Oct 16-19—Fall Meeting of Committee D-13 on Textiles, Warwick Hotel, New York, N Y.

**THE DRYSALTERS CLUB OF NEW ENGLAND**

Jan 30 (Hotel Vendome, Boston, Mass); May 4 (Hotel Vendome, Boston, Mass); June 22 (Outing, Wachusett Country Club, West Boylston, Mass)

**THE FIBER SOCIETY**

Spring Meeting—May 2-3, The Clemson House, Clemson, S C; Fall Meeting—Sept 6-7, Warwick Hotel, New York, N Y.

**THE INSTRUMENT SOCIETY OF AMERICA**

11th Annual Instrumentation-Automation Conference and Exhibit—Sept 17-21, New York Coliseum, New York, N Y

**NATIONAL COTTON COUNCIL OF AMERICA**

7th Annual Cotton Research Clinic—Feb 15-17, Pinehurst, N C.

**PERKIN CENTENARY**

May, 1956—London, England.

**PERKIN CENTENNIAL**

September 10-15, Waldorf-Astoria Hotel, New York, N Y.

**PHI PSI FRATERNITY**

Annual Meeting—April 19-21, Alabama Polytechnic Institute, Auburn, Ala.

**PHILADELPHIA TEXTILE INSTITUTE**

Feb 3 (Dedication of new Residence Hall—College Campus—2 pm; Luncheon—Germantown Cricket Club; Mid-Winter Banquet—Warwick Hotel, Philadelphia); June 14 (Annual Meeting and Clambake—6 pm—College Campus, Germantown, Pa); June 15 (Outing—Manufacturers Golf & Country Club, Oreland, Pa); June 16 (Commencement—College Campus—11 am).

**PLANT MAINTENANCE & ENGINEERING CONFERENCE**

Jan 23-26—Convention Hall, Philadelphia, Pa.

**THE QUARTERMASTER ASSOCIATION**

Annual Convention—Oct 27-28, Conrad Hilton Hotel, Chicago, Ill.

**QUEBEC SECTION, CANADIAN ASSOCIATION OF TEXTILE COLORISTS AND CHEMISTS**

Jan 21, Feb 18, Mar 17 (McGill Univ, Montreal, Que); Apr 20-21 (Annual Meeting, Sheraton Mt Royal Hotel, Montreal); June 16 (Annual golf tournament).

**SOUTHERN TEXTILE EXPOSITION**

19th Exposition, Oct 1-5, Textile Hall, Greenville, S C.

**SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES**

Feb 7, Mar 13, Apr 12 (Palm Terrace Suite, Hotel Roosevelt, New York, N Y); May 16-18 (Outing—Skytop, Pennsylvania); June 12, Sept 11, Oct 9, Nov 7 (Palm Terrace Suite, Hotel Roosevelt, New York, N Y).

**TEXTILE RESEARCH INSTITUTE**

1956 Annual Meeting—March 22-23 Hotel Commodore, New York, N Y.

**TEXTILE TECHNICAL FEDERATION OF CANADA**

5th Bi-annual Textile Seminar—June 5-7, Queen's Univ, Kingston, Ont.

# NAMES IN THE NEWS

Hensel

Hand

Shonk

Lindsay

Reiter

Ashcroft

*General Aniline & Film Corp has announced the election of WALTER A HENSEL to the post of vice president, and the appointment of PAUL F HAND as assistant to the president.*

*Mr Hensel will continue as general manager of the Company's Ozalid Div with headquarters at Johnson City, N Y. He has been with General Aniline since 1946.*

*Mr Hand succeeds JOHN DEUTSCH, who resigned as assistant to the president to accept a position with Lehman Brothers. Mr Hand had been export manager of the Antara Chemicals Div since 1948. He joined the firm in 1940.*

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D G CARMICHAEL has been named chief consulting chemist for Eastman Chemical Products, Inc.

In his new post, Mr Carmichael will advise the Textile and Chemicals Divisions on the planning and executing of development programs concerned with textile processing, dyeing and finishing. He will also consult with the process and development laboratories of Tennessee Eastman Co concerned with dye production and textile processing.

While Mr Carmichael's responsibilities cross divisional and company lines, for administrative purposes he remains on the Chemicals Division staff, reporting to J E MAGOFFIN.

Mr Carmichael was formerly chief chemist in the ECPI Textile Service Lab.

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*PETER M SHONK has been appointed sales manager of the Textile Colors Division of Interchemical Corporation. Mr Shonk joined the Textile Colors Division in 1948 and was appointed assistant sales manager in 1951. He will make his headquarters at the main office of the Textile Colors Division in Hawthorne, N J.*

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DWIGHT L WARDELL has been appointed advertising manager of Sandoz Chemical Works, Inc.

Mr Wardell will work closely with A T HANES, vice president, to develop advertising and publicity promoting Sandoz dyestuffs and chemicals to the rug, textile, paper, leather and aluminum industries.

Mr Wardell was formerly in charge of the advertising of high nickel alloys for The International Nickel Company, Inc. He also edited the company's distributor magazine, *Nickelsworth*.

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*EDWARD S PIERCE has been elected assistant vice-president of H W Butterworth & Sons Co, Bethayres, Pa. Mr Pierce has been sales manager of the textile machinery firm for the past year and formerly was general manager. He will continue as sales manager and will also be responsible for advertising, engineering, research and development.*

JAMES K LINDSAY has been elected treasurer of Heyden Chemical Corporation to take the place of GEORGE B SCHWAB, who is retiring. BERNARD REITER has been elected assistant treasurer.

Mr Lindsay will continue as secretary of Heyden, an office he has held since March 1953. He is also secretary and director of Nuodex Products Co, Inc and American Plastics Corporation, wholly owned subsidiaries of Heyden. Mr Lindsay is a director of St Maurice Chemicals Ltd of Montreal and Salicilatos de Mexico.

Mr Reiter will continue as treasurer and director of Nuodex Products Co, Inc and Nuodex International, offices he has held since 1954. Mr Reiter also is a director of Nuodex Ltd in England and Nuodex (Australia) PTY, Ltd. Mr Reiter joined Nuodex as comptroller and assistant treasurer in 1952.

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*A GRIFFIN ASHCROFT, vice president and director of research and development, Alexander Smith, Inc, resigned his position on December 31, 1955. Mr Ashcroft's resignation followed the decision of officials of the merged company of Alexander Smith, Inc and Mohawk Carpet Co, known as Masco Industries, Inc, to consolidate his department with facilities at the Mohawk plant in Amsterdam, N Y. (See "News of the Trade" for additional details).*

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ROBERT L McEWEN has been appointed coordinator of management recruitment and placement for the Chemical Divisions of Food Machinery and Chemical Corp.

Mr McEwen has been associated with the Becco Chemical Division of FMC at Buffalo, N Y, since 1935. For the past eleven years he has headed Becco's pulp and paper research and development program.

In his new post, Mr McEwen will work as a member of FMC Chemical Divisions' central industrial relations department in New York.

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*Five staff members of Harris Research Laboratories, Washington, D C, were awarded gold watches in recognition of ten years of service at the laboratory's annual Christmas dinner on December 16.*

*Awards were made to ALFRED E BROWN, vice president, and to LOUIS R MIZELL, W E C YELLAND, D C KNOWLES, and PAULINE STREICHER. Presentation was made by MILTON HARRIS, president of Harris Research Laboratories.*

*At the same time, Dr Harris announced that an extensive remodeling of the laboratories is being undertaken. Additional office space, enlarged research facilities, and improved laboratory accommodations are included.*

*During the eleven years of Harris Research Laboratories' operation, the quarters at 1246 Taylor Street, NW, have more than tripled in size, and the staff has increased to over forty.*

ROBERT E WILKIN of Hooker Electrochemical Co, Niagara Falls, N Y, was elected to the company's board of directors at a meeting of the board in New York on Dec 21. He was also named vice president and director of sales.

Mr Wilkin was formerly vice president and general sales manager.

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*RAYMOND F BOYER, director of plastics research of the Dow Chemical Company, Midland, Mich, has been elected chairman of the American Chemical Society's Division of Polymer Chemistry for 1956.*

*Dr Boyer succeeds HERMAN F MARK, director of the Institute of Polymer Chemistry of the Polytechnic Institute of Brooklyn. THOMAS G FOX, JR, laboratory head of the Rohm & Haas Company, Philadelphia, was chosen vice-chairman and JOSEPH DEC, assistant manager of paper and organic products of the Johns-Manville Corporation, Manville, N J, was re-elected secretary-treasurer.*

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Becco Chemical Division, Food Machinery and Chemical Corporation, has announced the following personnel changes:

BART WRIGHT and ROGER SULLIVAN have been appointed production superintendent and production engineer, respectively, assisting HARLOW HYATT, production manager of the company's Buffalo, N Y, plant.

NORMAN MICHAELIS has been named supervisor of the Control Laboratory succeeding Mr Wright. Mr Sullivan's position in the Engineering Research Laboratory will be filled by JOHN PARRONE, a chemical engineer newly associated with Becco.

*JOHN J MORAN has been named assistant vice president in charge of sales for Pepperell Manufacturing Co.*

*Mr Moran has been with the Company for more than 20 years. He was initially in the Boston office and was transferred to New York in 1941. Since that time he has served in various capacities connected with production and sales in that office.*

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The appointments of R BRUCE VAN ORDER and J ARNDT WEICKSEL to the New Product Development Department of American Cyanamid Company were announced last month.

Dr Van Order joined the Stamford Research Laboratories of Cyanamid in 1942, and later transferred to the Newark, New Jersey plant where he spent seven years in development work on ultramarine blue and fluoresceins. In 1953 he was named to head a new group called Dyes Formulation for the development of pigment dispersions at the Bound Brook, N J, plant.

Dr Weicksel joined Cyanamid's Stamford Research Laboratories in 1952.

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*The appointment of JOHN J ZICCARELLI to the Technical Sales Department has been announced by Glyco Products Co, Inc, Empire State Building, New York 1, N Y.*

*Mr Ziccarelli has been assigned to the New York office and will assist in covering Metropolitan New York, Eastern New York State and Northern New Jersey.*

*Mr Ziccarelli was formerly with California Texas Oil Company and Socony Mobil Oil Company in technical service and development work.*

# TECHNICAL LITERATURE

**(It is understood that the following literature is available from the sources listed in italics).**

**ADIPIC ACID**———*National Aniline Div, Allied Chemical & Dye Corp, 40 Rector St, New York 6, N Y*———bulletin I-12, an 8-page booklet, covers the six basic reactions of the carboxyl group and eleven basic reactions of the alpha methylene group. It also includes suggested uses for this chemical and a list of 45 literature references.

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**BURLING DIFFERENTIAL EXPANSION TEMPERATURE CONTROLS**———*Burling Instruments Co, 16 River Rd, Chatham, N J*———Catalogue G-20 includes pictures of all the current types, a description of their operation, general specifications of the entire line, and an instrument selection chart.

The instruments shown are said to be suitable either for controlling temperatures or for high temperature safety alarms and cut-outs. Both electric and pneumatic types are included, as are ranges from sub-zero to 1800°F.

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**CELLITON FAST BLUE LAFR**———*General Dyestuff Co, 435 Hudson St, New York 14, N Y*———G-791 (8 page) discusses the performance of this new Celliton dye on acetate, Dacron, and the acrylics. Under a section on Application are given details on dispersion for dyeing, and methods for dyeing acetate, Dacron and Dynel. Properties and fastness ratings are listed, and sample dyeings included.

Celliton Fast Blue LAFR reportedly occupies a significant place among Celliton dyes as a fast-to-gas-fading blue for acetate. Dyeings of this new, straight, disperse dyestuff on acetate also are said to be characterized by very good fastness to sunlight and by high resistance to dry-cleaning, hot pressing and perspiration, properties of prime importance in the acetate-clothing field.

Celliton Fast Blue LAFR is also especially recommended by GDC for dyeing fast shades on Dacron polyester fiber, and it reportedly may be employed likewise by suitable dyeing methods for dyeing fast shades on acrylic fibers, such as Orlon, Dynel, and Acrilan. Navies and Kersey greens are examples of deep shades that are being dyed on Dacron and Dynel by recipes containing this blue, it is stated.

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**CHEMICAL INTERMEDIATES (No. 98) and ORGANIC INTERMEDIATES (No. 112)**———*Research Information Service, 53 Nassau St, New York 38, N Y*———These new research bulletins list translations of German manufacturing processes and research reports from the file of I G Farbenindustrie A G.

The bulletins contain about 150 different manufacturing processes for intermediates. Reports are listed in alphabetical order according to the name of the substance to which the manufacturing process pertains.

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**CHEMICAL SAFETY DATA SHEET SD-53, HYDROGEN PEROXIDE**———*Manufacturing Chemists' Association, 1625 Eye Street, NW, Washington 6, D C; 30¢*———This 20-page booklet, part of a continuing series of safety data sheets, gives properties and essential information for the safe handling and use of hydrogen peroxide, including material on shipping containers, storage, waste disposal and health hazards and their control.

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**CYCLOHEXANOL** ——— *Monsanto Chemical Co, Organic Chemicals Div, 800 N Twelfth Blvd, St Louis 1, Mo*———Cyclohexanol, an intermediate and component of solvent systems in the textile, drycleaning and paint industries, is the subject of this revised technical data sheet, which illustrates such typical reactions of the compound as ester formation, dehydration and oxidation to cyclohexanone and adipic acid.

The major uses of cyclohexanol are for specialty products, such as cleaners, solvents and specialized soaps.

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**DENSITY OF MODIFIED COTTONS DETERMINED WITH A GRADIENT COLUMN** ——— *Southern Regional Research Laboratory, 2100 Robert E Lee Blvd, New Orleans 19, La*———With increasing interest in the chemical modification of cotton has come the need for a rapid, accurate method of determining the degree and uniformity of many such treatments. The density-gradient column method was developed at the Southern Utilization Research Branch of USDA's Agricultural Research Service to meet this need in all cases where it is applicable.

In chemical modification of cotton, the chemical used for treatment becomes a part of the cellulose molecule. Acetylation, for instance, is a substitution of acetyl groups for the hydroxyl groups; and a similar reaction takes place in cyanoethylation, carboxymethylation, or aminization. Substitution usually affects the density of the cotton; hence, a measure of density in those cases is a good measure not only of the degree of substitution but also of the uniformity of the treatment. Each case requires the preparation of a calibration curve with the assistance of an established method. Once this is done experimental results by means of the density-gradient column reportedly have been found to agree very closely with those obtained by chemical methods, and it is offered as the best method yet devised for determining substitution on minute quantities or for measuring uniformity of substitution in routine or quality-control determinations.

Equipment required is quite simple. For these studies the density-gradient columns were usually prepared in 100- or 250-ml graduated cylinders, which can be tightly stoppered to keep out atmospheric moisture. In cotton density measurements, carbon tetrachloride is suitable for the denser liquid at the bottom, and a mixture of

carbon tetrachloride and a lighter liquid, such as xylene, is suitable for the less dense, or top liquid. The column is calibrated with small, hollow glass floats of known density. Uniformity of substitution is determined as the dispersion of a large number of particles.

Details of the preparation and use of the gradient column are covered in this reprint from *Textile Research Journal*.

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**EPSILON CAPROLACTAM**——*National Aniline Div, Allied Chemical & Dye Corp, 40 Rector St, New York 6, N Y*——Technical Bulletin I-14 contains ten pages of fundamental data on Epsilon Caprolactam, a chemical not heretofore available from large-scale American commercial production. The bulletin gives complete chemical and physical properties of the material, which is now being shipped by National Aniline Division. It also covers basic reactivity and suggested uses. Included are a vapor pressure curve, infrared absorption spectogram and a list of 21 literature references.

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**FILTRATION MANUAL FOR PRODUCT DESIGNERS**——Dept FM, Purolator Products, Inc, *Rahway, N J; 25¢*——This new manual describes numerous filter applications and deals with such design considerations as flow rates, viscosities of fluids, and contamination to be removed, as well as filter costs, space requirements of the designer, types of filter elements and the proper selection of elements.

A complete glossary of filtration terms is also included in the manual, which contains numerous illustrations and charts.

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**HONEYWELL AMBI-STAT REMOTE BULB TEMPERATURE CONTROLLERS** —— *W A Lang, product editor, Minneapolis-Honeywell Regulator Co, Industrial Div, Wayne and Windrim Aves, Philadelphia 44, Pa*——Specification Sheet 866 describes the new Honeywell Ambi-Stat remote bulb temperature controllers, which are designed to provide close control with compensation for temperature differences between controlled medium and air surrounding tubing and bellows.

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**INDUSTRIAL APPLICATIONS OF MOLYBDENUM CHEMICALS**——*Climax Molybdenum Co, Dept L, 500 Fifth Ave, New York 36, N Y*—— This comprehensive review has been published by the American Chemical Society and is now available in reprint form from the Climax Molybdenum Co.

Comprising seven different papers, this survey details molybdenum's wide use in diverse chemical fields and points to new industrial applicatons resulting from the present increased tempo of molybdenum research. The papers were originally presented under the sponsorship of ACS's Division of Industrial and Engineering Chemistry.

The papers, which are also available individually, give the history, use and function of molybdenum and its compounds in catalysts, inorganic and organic pigments, metal coatings, alloy for the chemical process industries, and agriculture.

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**MONOMER-POLYMER CATALOGUE**——*The Borden Co, Chemical Div, Monomer-Polymer Dept, 511 Lancaster St, Leominster, Mass.*—— Prices and properties of more than 400 chemicals especially developed for use in industrial and research laboratories in the field of polymerization are listed in this catalogue. Also listed are catalysts and accelerators and cross-linking agents for the preparation of specialty polymers.

**NACCONATES (DIISOCYANATE)** —— *National Aniline Div, Allied Chemical & Dye Corp, 40 Rector St, New York 6, N Y*——National Aniline has issued a series of six technical bulletins on Nacconates (diisocyanates), containing comprehensive data on the properties and reactivity of this interesting group of polyurethan chemicals. National Technical Bulletin 1-17 is a fundamental brochure on diisocyanates as a class. Its 24 pages include generic properties, data on 27 basic reactions common to all diisocyanates, eight pages of suggested uses and a list of 132 literature references.

Five supplementary technical bulletins give specific technical data on the Nacconates (diisocyanates), viz Bulletin I-17A covers Nacconate 80 (mixture of approx 80% of 2,4-tolylene diisocyanate and 20% of 2,6-tolylene diisocyanate); Bulletin I-17B covers Nacconate 65 (mixture of approx 65% of 2,4-tolylene diisocyanate and 35% of 2,6-tolylene diisocyanate); Bulletin I-17C covers Nacconate 100 (essentially 2,4-tolylene diisocyanate); Bulletin I-17D covers Nacconate 200 (TODI—3,3'—bitolylene 4,4'-diisocyanate); Bulletin I-17E covers Nacconate 300 (MDI-diphenylmethane 4,4-diisocyanate).

The complete series of six bulletins or any of the individual bulletins may be had by writing on business letterhead to National Aniline.

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**ORGANIC CHLORINE COMPOUNDS**——*Carbide and Carbon Chemicals Co, 30 East 42nd St, New York 17, N Y*——This new 48-page book (F-4769) discusses the applications of eighteen products, their solvent properties, and their proper handling and storage. It includes important data on physical properties, specifications and test methods, shipping information, and constant boiling mixtures. Fourteen charts contain useful physical property data.

An important feature of this book is a list of references that gives additional sources for more detailed information on individual compounds.

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**PHYSICAL PROPERTIES OF SYNTHETIC ORGANIC CHEMICALS, 1956 EDITION** —— *Carbide and Carbon Chemicals Co, 30 E 42nd St, New York 17, N Y*——F-6136 is a 24-page edition featuring 32 new products available from Carbide and Carbon. It presents the latest data on more than 350 organic chemicals. Products are arranged by related groups with condensed data on applications. Physical properties are given in tabular form. An alphabetical index is included for easy reference.

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**RAPIDOGEN BLACK J**——*General Dyestuff Co, 435 Hudson St, New York 14, N Y*—— G-792 discusses shade, fastness properties, uses and working properties of this new stabilized azoic composition in powder form. The 4-page booklet also presents a recipe for acid aging, and lists specific fastness properties of 4% prints on cotton or rayon. A mounted sample dyeing on a 4% cotton print is included.

Rapidogen Black J was especially developed for printing jet blacks on cotton and rayon that are adequate in general fastness properties for dress goods. It is said to be characterized by unequalled strength and thus by exceptional economy where full blacks are required.

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**1956 SILICONE REFERENCE GUIDE**——*Dow Corning Corp, Midland, Mich* —— This completely new reference guide to Dow Corning's silicone products is half again as large as last year's. It describes almost 150 of the most generally used silicone products, 18 of which were introduced within the last 12 months.

As in the past, the products are grouped by psysical form and cross-indexed by usage.

Product descriptions are devoted to essential data. Thoroughly illustrated with charts, tables, graphs and application photographs. Twelve pages, printed in two colors.

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**SYNTHETIC ORGANIC CHEMICALS, UNITED STATES PRODUCTION AND SALES, 1954** (Report No. 196, Second Series) —— *Supt of Documents, Government Printing Office, Washington 25, D C; 60¢*——This report, released by the U S Tariff Commission this past fall, discloses that the combined production of all synthetic organic chemicals and their raw materials amounted to 61,507 million pounds in 1954, slightly more than the 60,759 million pounds reported for 1953. These figures represent totals for raw materials, semifinished and finished products and so necessarily involve considerable duplication.

The statistics given in the final report, the thirty-eighth issued by the Commission on the industry, were compiled from data supplied by 605 companies and company divisions. The report covers more than 6,000 individual items, and gives production and sales statistics on many of them, together with a list showing the manufacturers of each chemical on which production or sales were reported. Also included in the report are statistics on United States general imports of products entered during 1954 under paragraphs 27 and 28 of the Tariff Act of 1930, which cover intermediates, dyes, medicinals, and other finished products of coal-tar, or cyclic derivation. In addition, the report gives statistics on the number of workers engaged in research in the industry, their average salaries, and the amounts expended for research by the synthetic organic chemicals industry.

The report is composed of three major sections—chemical raw materials, cyclic intermediates, and finished synthetic organic chemical products. The finished products are further classified according to their major use as dyes, toners and lakes, medicinal chemicals, flavor and perfume materials, plastics and resin materials, elastomers, rubber-processing chemicals, plasticizers, surface-active agents, pesticides and other organic agricultural chemicals, and miscellaneous chemicals.

Total sales of dyes for 1954 as compared with 1953 showed a decrease of 4.3 percent. Toners and lakes decreased 3.9 percent, elastomers (17.6%), plasticizers (1.6%), and miscellaneous chemicals (1.9%). Increases were recorded for surface-active agents (35.5%), rubber-processing chemicals (3.8%), and plastic and resin materials (2.3%).

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**THE NONIONIC OCTYLPHENOXYETHANOL (OPE) SERIES**——*Rohm & Haas Co, Washington Sq, Philadelphia 5, Pa* —— This 19-page booklet describes the complete series of Triton nonionic surface-active agents manufactured by Rohm & Haas Company. Derived from ethylene oxide condensed in varying chain lengths with hydrophobic octylphenol, these surfactants range in solubility from completely water-insoluble short chain members to the higher members, which are said to have excellent solubility in hard water and brines at all temperatures.

Discussion and data on physical properties, solubility characteristics and viscosity characteristics of aqueous solutions of these Triton surfactants is included. In addition, the booklet presents surface and interfacial tension measurements and data on emulsification tendencies, wetting, foaming and hard surface detergency. Toxicity data on most members of the series are given, and brief references to quantitative analytical methods made.

An informative list of suggested applications, with a chart matching requirements to products of the series, makes up the final section of the booklet.


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— JAPANESE FOR

SPECIALIZATION

IN ANY LANGUAGE,

PEERLESS MEANS SPECIALIZATION

PEERLESS COLOR COMPANY, INC.

521-535 North Avenue, Plainfield, New Jersey

Manufacturers of Dye Colors since 1916.

Export Representative: Herbert Lorenz, Inc., World Traders

299 Madison Avenue, New York 17, N. Y.

Cables: HACOLORENZ